Does the Tail Wag the Dog? Small-Firm-Bias in Capital Market Research

Dan Givoly, *Pennsylvania State University*
Carla Hayn, *University of California, Los Angeles*
Ben Lourie, *University of California, Los Angeles*

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Abstract

We provide evidence showing that prominent anomalies documented by past accounting research, particularly those attributed to investor biases and lack of sophistication, are limited to small firms which collectively represent a small fraction (typically, less than10%) of the market value of the equity markets. When firm observations are weighted by their market value, none of these anomalies is significant. Our results are consistent with cognitive behavior and sophistication of investors as explanations for these anomalies rather than the improper measurement of risk. The findings emphasize the need to put these anomalies, and other findings that have implications for market efficiency and resource allocation in perspective by assessing their economic importance.

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1. Introduction

Much of the empirical evidence on market anomalies and irregularities relies on results obtained from large samples of firms, comprised typically of the universe of firms on a major financial database such as COMPUSTAT or CRSP. Observations in the form of number of firms or firm-years, regardless of the market value they represent, are assigned an equal weight in computing the relevant statistics such as means, correlations, or regression coefficients and in drawing statistical inferences.

Researchers in the accounting and finance areas generally use large samples to examine various phenomena such as the degree of market efficiency (e.g., the presence of anomalies), the behavior of market participants (e.g., bias in analysts' forecasts or investors' cognitive biases), the degree of investor sophistication (e.g., the accrual anomaly), or the impact of accounting standards. Because of their size these samples may lead to inferences tainted by a "small- firm bias." By "small-firm bias" we mean the disproportionate weight assigned to the large number of small cap companies in the examined samples relative to their market capitalization. As a result of this bias, the applicability of findings based on an equal weighting (rather than on a market-value-weighting) to the capital market as a whole is limited. For example, an anomaly which is present only for small companies though they may constitute a large number of the sample firms has, collectively, a negligible aggregate market value and is thus not as economically important for assessing the functionality of the overall capital markets. In general, inferences about "market efficiency" or "investor sophistication" based on an equal weighting of observations, while perhaps valid for the "average firm," have different, and often more limited implications for the functioning of the capital markets as a whole and for regulatory policies than those that are based on value weighting these observations.[1]

[1] A "large-firm bias" in the form of overrepresentation of large firms in the research sample may also exist in studies in which data availability requirements are not met by small firms.

The potential small-firm bias is particularly relevant in assessing the economic importance of accounting anomalies attributed to the information environment or investor sophistication and behavior, both of which are related to firm-size.

The literature contains limited evidence and analysis on the extent of the firm-size bias due to the equal weighting of observations.[2] To be sure, some anomaly-related studies incorporate firm-size as an explanatory variable and find that firm-size is negatively correlated with the extent of the anomaly. However, such findings do not reveal the impact of the accounting anomaly in terms of the market value of the equity affected or whether the anomaly exists at all for firms above a certain size.

The objective of this study is to fill this gap by assessing the economic importance of major market phenomena identified by the accounting literature. We focus our attention on phenomena that have implications for investor sophistication, market efficiency and financial reporting. Specifically, the phenomena (most of which are referred to as "anomalies") that we examine are: (1) the post-earnings announcement drift (Bernard and Thomas 1989, 1990), (2) the accrual anomaly (Sloan 1996), (3) the limited attention hypothesis (Hirshleifer and Teoh 2003; Francis et al. 1992; DellaVigna et al. 2009), and (4) the optimistic bias in analysts' forecasts of earnings (Richardson et al. 2004; Matsumoto 2002; a survey by Brown 1993 and the references therein).

The results show that inferences regarding the presence and strength of these anomalies critically depend on whether an equal-weighting or a value-weighting approach is used in computing the sample statistics. Specifically, the anomalies are not significant among large firms which, collectively, represent 90% or more of the aggregate value of the stock market. More importantly, none of the anomalies documented by previous studies (that used an equally weighting scheme) is present when observations are weighted by their corresponding market values. In other words, the major anomalies in accounting, which

[2] One exception is Fama and French (2008) who provide an assessment of the strength of a number of market anomalies identified in the finance literature (such as momentum, book-to-market, value, or net stock issuance) by firm-size groups, and examine also the accounting accruals anomaly. We refer to their findings in section 4.2.

are examined by this paper, are economically negligible in terms of the dollar value of investment subjected to them.

The prevalence of an anomaly is, of course, of interest even when it does not affect a significant share of the total market value. Studying such anomalies enhances our understanding of investor and management behavior, trading mechanisms, the functioning of financial intermediaries, and the effectiveness of regulations. However, the distinction between the pervasiveness of an anomaly in terms of the number of firms affected by it and its economic significance in terms of the market value affected is an important consideration for researchers investigating its causes and for regulators addressing its impact and responding to it.

Some anomalies do not appear to be widely acted upon by the investment community as evidenced by the long periods over which these anomalies persist and the fact that they are not considered in the deliberations of regulatory bodies and accounting standard setters. Our finding that certain anomalies affect only smaller firms and thus do not have a significant effect on the average dollar invested in the stock market at least partially explains this lack of a stronger interest and response by the investment community and regulatory bodies.

This study contributes to the vast literature on market anomalies by providing evidence on the economic significance of major anomalies that relate to the information environment of firms. It further highlights the importance of inferences based on a value-weighted approach in rendering the research results more relevant for investors, regulators and standard setters.

The remainder of the paper is organized as follows. The next section provides a discussion on the factors contributing to the potential firm-size bias. Section 3 summarizes the relation between firm size and the information environment. Section 4 reviews the market phenomena examined in the paper and section 5 details the methodology used in measuring them. Section 6 describes and discusses the results and the last section contains a summary and concluding remarks.

2. The Potential for Firm-Size Bias

The use of large samples that include many small firms is a recent phenomenon in research that is facilitated by computerized databases. Because of limited data availability and the reliance on hand-collected data, most of the early empirical studies in accounting, including some seminal papers, used much smaller samples consisting of relatively large firms. To illustrate, early studies whose findings laid the foundation for an enormous body of accounting research on the information content of earnings, such as Ball and Brown (1967 and 1968), and Beaver (1969 and 1970) are based on samples whose size is, respectively, 312, 261, 143 and 100 firms. The classic studies on the time-series and cross-sectional properties of accounting number by Albrecht et al. (1977), Foster (1977), Watts and Leftwich (1977) and King (1966) are based on samples of 49, 175, 32 and 316 firms, respectively. The influential study by Altman (1968) on the use of accounting numbers for bankruptcy prediction relies on a sample of 33 bankrupt firms.

The continuous expansion over the years of the firm-coverage by the main databases enabled researchers to use larger and larger samples. Table 1 shows the number of firms included on the three main financial databases commonly used in capital market research – COMPUSTAT, CRSP and I/B/E/S. All databases expanded their coverage considerably during the 1980s and the 1990s. Overall, the firm coverage by COMPUSTAT and CRSP increased 17-and 7-fold, respectively, between 1950 and the present.

Large samples became common in studies that address general, market-wide phenomena such as the information content of earnings, the time-series of earnings numbers and the exploration of various market anomalies. For example, Sloan (1996) employs a sample of about 1,300 firms per year; Bernard and Thomas (1989) rely of a sample of more than 1,600 firms per quarter, and Foster et al. (1984) use 2,053 firms per quarter. Studies on the change over time in the information content of earnings such as Collins et al. (1997) and Francis and Schipper (1999) use samples that increase in size over the sample period from a few hundred firms in the 1950s to over 3,500 firms in the 1990s.

Such large samples inevitably have a greater representation of small firms. Further, the expansion of the available databases has been accompanied by an increase in the disparity in firm-size. Table 2 demonstrates that firm-size "inequality" has indeed increased over time. In 1980, the firm lying exactly at the 99% point of the cumulative firm-size distribution based on the market value of equity was 160 times larger than the firm lying exactly at the 1% point of that distribution. In 2013, this multiple increased to 259. Another related measure of size inequality in the databases, the ratio of the aggregate market value of firms in the largest and smallest deciles of the firm-distribution of the market value of equity, more than doubled from 1,089 in 1980 to 2,487 in 2013.

The potential for firm-size bias is best illustrated by considering the distribution of firms by firm-size. The distributions at the end of 2013 of firms covered by the intersections of the main databases employed in archival accounting research , (1) COMPUSTAT and, CRSP, (2) COMPUSTAT, CRSP and I/B/E/S, and (3) these three databases plus EXECUCOMP, is plotted in figures 1A and 1B and tabulated in table 3. All three distributions are extremely skewed. Consider, for example, the skewness of the firm-size distribution of firms covered by COMPUSTAT and CRSP. Table 3 shows that out of the 6,531 firms that appear on both databases at the end of fiscal 2013, the largest 10% and 20% firms represent, respectively, 78.23% and 89.31% of the market value of all firms. Further, the aggregate market value of the smallest 50% of the firms is only 1.7% of the total market value of all firms in this universe.[3]

The predominance of small firms in large research samples becomes less pronounced as additional, more specific data (e.g., on analyst forecasts as provided by I/B/E/S or executive compensation as provided by EXECUCOMP) are required by researchers. This is because the more specific databases tend to have more limited coverage of small firms: While the largest 1% of the firms in the combined COMPUSTAT and CRSP databases represent 34.98% of all firms, they represent only 29.08% and 22.17% of all firms when this combined database is augmented by I/B/E/S or by both I/B/E/S and

[3] The typical study may impose additional data requirements such as availability of information on corporate governance or auditors. However, databases containing such information have developed and expanded over the years and are no longer limited to large firms.

EXECUCOMP, respectively. Despite the lower size disparity in the more specialized databases, it is obvious that they, too, suffer from a small-firm bias when statistical inferences are based on the "egalitarian" approach whereby each firm is weighted equally.

3. Firm size and the information environment

The association between firm size and the firm's information environment has long been recognized in the literature. The factors considered to represent the information environment include information production (proxied by variables such as the number of analysts following the firm or trading volume), sophistication in processing the information (institutional holdings), asymmetry of information (ownership concentration) and price efficiency (bid-ask spread). We provide the median values of these proxy variables firms-size deciles in the Appendix. The Appendix, which is based on 2013 data, shows that as one moves from firms in the bottom decile of the firm-size distribution (with firm-size is captured by the market value of equity) to the top decile of that distribution, all indicators of extent of information on the firm, investor sophistication, and trading liquidity increase, mostly in a monotonic manner. For example, moving from the smallest- to the largest-size decile, the median analyst coverage goes from 2 to 20 analysts, the percentage of institution investors increases from 29% to 59%, the number of news reports on the firm for the year goes from 171 to 1,887, and the monthly trading volume rises from $6 million to $3,153 million. The smallest 10% of the firms have a much higher ownership concentration as gauged by the Herfindah-Hirschman Index than the largest 10% firms (0.156 vs. 0.039) and a higher bid-ask spread (0.0123 vs. 0.0041).

Past research provides ample evidence that larger firms operate in a much richer information environment than do smaller firms. A number of early studies (Beaver 1968, May 1971 and Atiase 1985) show that earnings announcements by large firms contain less news as gauged by the extent of the market response than those made by smaller firms. A similar result is found when changes in the trading volume are used to assess the news in earnings announcements (Bamber 1986). Consistent with these findings, earnings are incorporated earlier in stock prices r for large firms than for small firms (Freeman 1987). All

of these findings are attributed to the greater production and dissemination of information by larger firms as compared to smaller firms.

This widespread evidence on the market's reaction to earnings announcements makes the a priori belief that larger firms are less susceptible to market anomalies, particularly those related to information, investor sophistication and cognitive biases, very compelling.

4. Review of the Evaluated Anomalies and their Potential Relation to Firm Size

In this section, each of the evaluated anomalies is reviewed and a discussion of their relation with, and possible explanation by, the firm's information environment and investor sophistication is provided.

4.1. Post Earnings Announcement Drift

Post earnings announcement drift (PEAD) has been observed in the form of a positive correlation between the earnings news and stock returns well past the earnings announcement day. The anomaly was first documented by Ball and Brown (1968) and further explored and analyzed in numerous studies beginning with Foster et al. (1984) and Bernard and Thomas (1989). The evidence shows that earnings forecast errors are positively correlated not only with stock returns during the earnings announcement period and a short period (of a few days) following it but also with stock returns over weeks and months thereafter. The evidence is consistent with the notion that investors underreact to earnings surprises and that this underreaction is due to their inability to fully incorporate the implications of current earnings for future earnings (Bernard and Thomas 1990).

Empirical evidence suggests that the PEAD anomaly is related to investor sophistication. Bartov et al. (2000) find that institutional ownership, which serves as a proxy for investor sophistication, is inversely related to the abnormal returns following earnings announcements. Consistent with the notion that small investors are less sophisticated than larger ones, Battalio and Mendenhall (2005) show that small investors (defined as those executing small trades) naively rely on reported earnings and are therefore among the drivers of the PEAD phenomenon. Additional evidence consistent with this finding is provided

by Shanthikumar (2004) who documents that small traders lag behind large traders in responding to earnings news.

Battalio and Mendenhall (2005), among others, show that the correlation between firm size and the average trade size is significantly negative while that between firm size and both analysts' following and institutional holdings (attributes associated with, respectively, the amount of information and the degree of investor sophistication) is significantly positive. Bartov et al. (2000) indicate that the magnitude of the PEAD is negatively related to the extent of institutional holdings of the firm's stock. Interestingly, they also find that the PEAD phenomenon exists and is significant even for the firms with the highest level of institutional ownership.

More direct evidence on the relation between firm size and the magnitude of PEAD is provided by Foster et al. (1984), Bernard and Thomas (1990) and Bhushan (1994). Foster et al. (1984) find that firm-size is negatively related to the abnormal return from the anomaly but that, still, this return is significant for the top quintile of the companies listed on the NYSE. Bernard and Thomas show that the PEAD phenomenon is less pronounced for firms in the top three deciles of the firm-size distribution. Bhushan finds that the drift is inversely related to trading volume and share price, both of which are positively associated with firm-size. Kothari et al (2006) study the stock market reaction to *aggregate* earnings news and find the response of the stock market index to aggregate earnings does not exhibit post-announcement drift. In fact, aggregate returns correlate negatively with concurrent aggregate earnings. While their study does not address the PEAD for individual firms, it contains some results concerning the effect of individual firm size on the anomaly. Specifically, it shows that, while PEAD is prevalent among firms and exists in all size groups, when firms were aggregated into three size groups – large, medium, and small, PEAD exists only in the group of small firms.

The above findings strongly suggest that the observed PEAD anomaly that holds "on average" may be economically unimportant or even insignificant when measured based on a market-value weighting of the observations.

4.2. The Accrual Anomaly

The accrual anomaly originally documented by Sloan (1996) suggests that investors fail to recognize the differential persistence of the cash and accrual components in earnings. Specifically, investors overestimate (underestimate) the lower (higher) persistence of accruals (cash flows) when forming earnings expectations. As a result, firms with relatively high (low) levels of accruals (cash flows) in a given period experience negative (positive) future abnormal returns in the following periods, giving rise to the so-called “accrual anomaly.”

Although some studies attribute at least part of the anomaly to discretionary accruals possibly arising from earnings management (e.g., Chan et al. 2006 and Xie 2001) or to less reliable accruals (Richardson et al. 2005), the presence of such an anomaly implies “accounting fixation” and a lack of investor sophistication.

Collins et al (2003) show that the mispricing of accruals is less pronounced for firms with a high degree of transient institutional ownership, an ownership group that is presumably sophisticated and, further, most likely to undo mispricing through trading. Evidence in Green et al. (2011) shows that the hedge returns to the accrual anomaly in the U.S. stock markets have diminished over time to the point where they are no longer positive beyond 2002. This decay is attributed to the fact that the accrual anomaly has been exploited by sophisticated investors.

Given the positive association between firm size and investor sophistication discussed in the previous section on PEAD, one would expect the accrual anomaly to be more pronounced for smaller firms. The limited evidence on the effect of firm size, however, appears inconclusive. Fama and French 2008 examine the relation between firm-size and the effect of an array of market anomalies, among them the accrual anomaly. They find that the hedge returns from this anomaly are significantly positive for all the firm-size groups they examine. They do find, however, that the contribution of the long positions (taken

following extreme negative accruals) to these hedge returns is not significant for smaller firms.[4] Cheng et al. 2012 find that accrual mispricing is not affected by size and is actually weaker for small firms.

A number of studies question whether the accrual anomaly is a reflection of lack of sophistication by investors. Ali et al. 2000 show that the effect of the anomaly is not weaker for larger firms or for firms less followed by analysts or held more by institutions.[5] Additional evidence inconsistent with the naïve investor explanation to the anomaly is provided by Bradshaw et al. 2001 who show that analysts and auditors, groups that are presumably sophisticated readers of the financial statements, also fail to properly evaluate the relative persistence of cash flows and accruals. Kraft et al. (2006) find that, after excluding a small number of extreme observations, the relation between buy-and-hold abnormal returns and total accruals follows an inverted U-shape, which is inconsistent with the investor-sophistication or "fixation" explanations for the anomaly. So, while the accrual anomaly is quite robust and prevalent, the evidence regarding its common interpretation as reflecting investors' lack of sophistication is inconclusive.

4.3. The "Limited Attention" Hypothesis

Work by Hirshleifer and Teoh (2003) and others suggest that, because of the enormous amount of information arriving for a multitude of traded stocks, investors are unable to process and act upon all relevant information in a correct and timely manner. The result is an underreaction to salient news and non-optimal investment decisions. In a way, the accrual and the PEAD anomalies could both be viewed as a manifestation of this "limited attention by investors" explanation. Past research documents manifestations of investor behavior consistent with limited attention. These manifestations include the tendency of workers to stick to the default option offered by their firm with respect to asset allocation of their pension contributions (Longstaff et al. 1999) or to divide the contribution evenly over the offered

[4] It is difficult to reconcile the results of this study with those of other studies on the anomaly because of its different measurement of accruals and somewhat different empirical design.
[5] Collins et al. (2003) suggest that Ali et al. (2000)'s finding of no association between institutional holding and the magnitude of the accrual anomaly might be due to the fact that the earlier study does not distinguish between "passive" and "transient" institutional ownership groups.

options, regardless of their number (Benartzi and Thaler 2011), or the failure of investors to exercise in-the-money options at expiration (Madrian and Shea 2000).

More related to accounting information are the findings of the muted stock price response to earnings announcements made at a time when investors are likely to be distracted. Such times include Friday (DellaVigna and Pollet 2009, and a similar muted response on Friday to merger announcements – see Louis and Sun 2014), days in which a high number of concurrent earnings announcements are made (Hirshleifer et al. 2009), after trading hours (Francis et al. 1992), during widely-watched basketball games (Drake et al. 2015). In the same vein, investor attention is hypothesized to be grabbed by extreme hikes in the stock price in the period immediately preceding the earnings announcement (Aboody et al. 2010).

The degree of investors' sophistication as well as their efforts and investment in information search and analysis are likely to be positively related to the market value at stake. As a result, limited attention is expected to be less evident in the stock price behavior of larger firms.

4.4. Optimistic Bias in Analyst Forecasts

While not typically counted as a stock market anomaly, a considerable body of research shows that analysts issue upwardly-biased earnings forecasts early in the forecasting period (Barefield and Comiskey 1975, Crichfield et al.1978, Fried and Givoly 1982, Brown et al.1985; see Kothari 2001for a review of this literature). One explanation for the observed optimistic bias in analysts' forecasts early in the period is that analysts attempt to minimize the median, rather than the mean, error in their earnings forecast (Abarbanell and Lehavy 2003, Gu and Wu 2003, and Basu and Markov 2004). Others suggest that the bias is strategic and relates to analysts' wish to promote revenue-generating business for their brokerage house and to facilitate information access to management (see, for example, Dugar and Nathan 1995 and Ke and Yu 2006). [6] Another, possibly related, forecasting pattern found by past research is that forecast revisions during the period turn analysts' initial upwardly-biased forecasts to downward-biased forecasts

[6] An additional explanation has been offered by Louis et al. (2014) who hypothesize that the bias is due, at least in part, to the failure of analysts to fully adjust their initial forecasts for conservatism.

at the end of the period just prior to the earnings announcement. The common explanation for the subsequent "walk-down" pattern during the forecasted period is that management provides guidance to the analysts that will enable the company to more easily meet or beat the outstanding analysts' forecasts (see, for example, Richardson et al. 2004).

The explanations for both analysts' initial optimistic bias and subsequent downward revisions may relate to firm size. Specifically, the skewness of the earnings distribution (the first explanation) is likely to be more pronounced for small firms, prompting more biased forecasts for these firms. Indeed, one manifestation of skewness - the frequency of losses - is much more pronounced for small than large firms. The incentive to issue optimistic forecasts to facilitate management communication (the second explanation) is likely to be stronger for smaller firms since there is less publicly available information on these firms, making such private communication more valuable to an analyst. Further, there are fewer competing sources of information, leading the analysts to rely more heavily on management guidance. Such earnings guidance, which is a common explanations for the "walk-down" in expectations during the forecast period (see Richardson et al. 2004), is likely to be more effective and less costly for smaller firms that are followed by just a few analysts and for which there is less research and information from non-management sources. Given its presumed association with firm-size, we include in our analysis a test on the variation this phenomenon across firm-size groups.

5. Sample and Empirical Design

The samples used for our various tests cover either the 35-year period of 1980 to 2014 or a substantial subset of this period, and are comprised of either annual or quarterly observations. The financial data for most of the tests are retrieved from COMPUSTAT, CRSP and I/B/E/S. More detailed description of the data and sample used in individual tests is provided as part of section 6.

Our empirical work represents primarily replications of previous studies on certain anomalies and phenomena, augmented by an analysis of the effect of firm-size on the findings. Accordingly, the empirical design and statistical tests follow closely those used by the original studies on the respective

anomalies. They are described in the remainder of this section. Note that most of the replicated studies use a number of variations of the original tests, employing different alternative specifications (for instance, different definitions and specification of the earnings and return variables). To achieve comparability with previous studies, we present the results of the replication based on that set of specifications used to produce the main results presented in the original study. For comparability, we use a starting year so as to maximize the overlap between our test period and the examined period of the main study that introduced the anomaly.

5.1. Examining Post Earnings Announcement Drift

We examine the PEAD anomaly for a test period of 31 years from 1983 to 2013. The anomaly is gauged by the return to hedge portfolios in which a long (short) position is held in stocks whose earnings surprise is among the 10% most positive (10% most negative) over the 60-day period beginning the second day following the day of the quarterly earnings announcement. The quarterly earnings surprise is defined as the difference between actual quarterly earnings-per-share (EPS) and the median consensus EPS forecast for the quarter available immediately prior to the earnings announcement, deflated by the share price at the end of the reported quarter. Stale forecasts (those that are older than 90 days as of the announcement date) are removed from the computation of the median forecasts. To identify the hedge portfolios, firms are partitioned into deciles by ranking the earnings surprises each fiscal quarter, with the long (short) portfolios consisting of the firm-years with the highest (lowest) earnings surprise decile.

To derive the hedge portfolio returns, we compute for each firm-quarter the abnormal return over the 60-day period following the earnings announcement as defined above. The abnormal return is computed as the difference between the compounded daily stock return over the 60 days and the compounded market return for this same period. The mean hedge portfolio return is derived for all firm-quarters and, separately, for firms within each of ten firm-size deciles. Firms in each quarter of a fiscal year are assigned to firm-size deciles based on the distribution of the market value of equity of firms at the beginning of the fiscal year.

5.2. Examining the Accrual Anomaly

The accrual anomaly is measured as the return to hedge portfolios in which long (short) positions are held in stocks with extreme negative (positive) accruals in the current fiscal year over a period following the earnings announcement for the year. Accruals are defined as Net Income minus Cash Flow from Operations.

The accrual measure has typically been deflated by total assets. However, as shown by Hafzalla et al. (2011), a trading strategy based on deflating accruals by the absolute value of net income rather than total assets when ranking the magnitude of accruals yields significantly larger annual hedge returns as compared with deflating them by Total Assets. Accordingly, we use the absolute value Net Income as a deflator for our accruals measure. We rank firms each year by the signed magnitude of their accruals and divide them into 10 portfolios from the most positive to the most negative accruals.

We also form 10 firm-size portfolios based on the firms' market value of equity at the beginning of each fiscal year. We compute abnormal returns compounded over a period of 12 months starting with the fourth month of the fiscal year following the fiscal year to which the earnings announcement relates. To be consistent with previous studies on the accrual anomaly, abnormal returns are defined as the size-adjusted returns.[7] The analysis is conducted for accrual portfolios formed annually over the years 1987-2013, the period beginning with the year in which cash flow from operations data are available.[8]

5.3. Examining the Limited Attention Hypothesis

As noted in the discussion above, a number of studies examine potential manifestations of limited attention by investors. We revisit the analysis of three such manifestations – the weaker response to earnings announcements made on Fridays relative to those made on other weekdays (DellaVigna and

[7] We also conducted our main tests using alternative specifications for the accrual and return variables. Specifically, we used an alternative accrual measure in which accruals are deflated by total assets. The alternative abnormal return specifications used accumulated market-adjusted returns rather than compounded abnormal return over the holding period. Use of these alternative specifications led to similar results and inferences.

[8] Estimating accruals from changes in balance sheet accounts leads to considerable measurement errors (see Hribar and Collins 2002).

Pollet 2009), the lack of attention to earnings announcement made during important basketball games (Drake et al. 2015), and the attention-grabbing power of stocks with recent price run ups ("past winners," Aboody et al. 2010).

5.3.1. Inattention to Friday Announcements

To test the response to earnings announcements made on Friday as compared with those made on other weekdays, we construct a hedge portfolio for, separately, Friday and other-weekday announcements. We take long (short) positions in stocks with extreme positive (negative) quarterly earnings surprises over the two-day period consisting of the announcement day and the following day. We then test for the difference in the market-adjusted returns over this two-day period for the two hedge portfolios. The earnings surprise is defined in section 5.1 above. Extreme positive (negative) surprises are defined each year as those in the top (bottom) quintile of the earnings surprise distribution.[9] We test for the difference in the market-adjusted returns of the hedge portfolios for all firm-quarters and, separately, within firm-size deciles. The firm-size decile is determined each quarter based on the firms' market value of the equity at the beginning of the year.

5.3.2. Inattention to Earnings Announcement Made During March Madness Games

Drake et al. 2015 conduct a series of tests on the market reaction to earnings announcements that are made during the weeks, days and hours of the basketball games played in the annual NCAA Division I Men's Basketball Tournament. They use different samples and measures to assess the market reaction. We replicate their main test in which they examine the market reaction to announcements made in the first round of this tournament held on Friday and Thursday, the "test period" (typically occurring in the third week of March). We extend their sample, which encompasses the years from 2000 to 2012, by two years by including the 2013 and 2014 tournaments. The control period during which the market reaction is expected to be "normal" and to which the response to announcements made in the test period is compared consists of earnings announcements made on Thursdays or Fridays in February or March prior

[9] Defining extreme surprises as those in the top or bottom deciles rather than quintiles results in a loss of observations but leads to essentially the same results.

to the day (Thursday) on which the tournament begins, or after April 11 (when the commotion and excitement of the tournament has presumably subsided). Dates of the tournament and the control periods are collected based on information contained on the website of AllBrackets.com and other websites (including Wikipedia).

The authors use a regression model to test for the difference in the market reaction. In general, the model regresses the cumulative abnormal return during the announcement period (days 0,1 where day 0 is the announcement day), denoted as *AR*, against the degree of the earnings surprise (denoted as UE, unexpected earnings) and an indicator variable, *TourneyDay*, which receives the value of 1 if the announcement occurs during the first-round game days and 0 otherwise. The regression is the form:

$$AR = f\{\text{year and industry fixed effects, } UE, TourneyDay, UE * TourneyDay, \text{ controls}\} \quad (1)$$

To render our results more comparable to those reported by Drake et al. 2015, we follow their methodology for normalizing the earnings surprise (defined in 5.1 above). Specifically, earnings surprises are ranked each year into deciles and the deciles are assigned to a range between -0.5 to +0.5. Scaled ranked values of 0 correspond to firms with earnings surprises at the sample median. Drake et al. use a more intricate specification in which they also control for the possibility of a selection bias in firms' choice of which particular tournament or which Friday on which to announce their earnings. To keep the model relatively simple, we do not incorporate controls for this choice. However, we see no reason why use of this reduced model would affect our inferences regarding the role that firm-size plays in determining investor attention to earnings announcements made during tournament days.

5.3.3. Attention Grabbing Effect of "Past Winners"

Following Aboody et al. (2010), we test the extent to which investors' attention is drawn to past winners by examining the association between the market-adjusted return over the 5-day period ending with the earnings announcement day (the "pre-announcement period," consisting of days -4 to 0, with 0 being the earnings announcement date) and the recent price run up of "past winners." Past winners are defined each quarter as those stocks at the top percentile or decile of the distribution of the raw returns over the 12-month period before the end of the fiscal quarter.

Aboody et al. (2010) also examine potential price reversals in the five days following the earnings announcements of past winners though they do offer any hypothesis regarding the magnitude and duration such reversals. We replicate their examination of the reversal and provide the results by firm-size.

We use for our tests all firm-quarters with available data for the years 1980-2014. We conduct the above analyses for all firm-quarters and by firm-size deciles. The ranking of firms by their firm-size is done each quarter based on the firm's market value of the equity at the beginning of the year. Consistent with Aboody et al. 2010, we use for this analysis December fiscal-year firms so as to define "past winners" in a comparable manner across firms and over time.

5.4. Optimistic Bias in Analysts' Forecasts

The bias in analysts' earnings forecasts is defined as the difference between the actual and forecasted diluted earnings-per-share deflated by either price at the beginning of the fiscal year or the absolute value of the actual EPS number. Stale forecasts (those over 90 days old) are excluded from the analyses. Two measures of bias are analyzed: the percentage of firms whose consensus diluted EPS forecast for the year is above (or is equal to or above) the actual EPS number. The bias is measured monthly over a period of 11 months that commences with the fourth month of the fiscal year being forecasted to the second month of next fiscal year.

6. Results

6.1. Post Earnings Announcement Drift

The results of this anomaly by firm-size deciles are presented in table 4, panel A. The finding show the presence of the anomaly for the full sample: A hedge portfolio formed in which long (short) positions are taken based on the most extreme 10% of the positive (negative) earnings surprises and held for 60 days starting with the second day following the earnings announcement yields an average market-adjusted return of 5.04% over that period. This abnormal return is statistically significant at greater than the 1% significance level.

Examining the ten portfolios based on firm size, note that the hedge portfolio return is positive for all 10 of the firm-size portfolios. However, the magnitude and significance of this return declines almost monotonically with the increase in firm-size, from sizeable and statistically significant hedge returns of 7.03% and 8.98% for portfolios 1 and 2 consisting of the smallest firms to only 0.67% and 0.64% for firms in portfolios 9 and 10 consisting of the largest firms in the sample. These results are consistent with the finding of Bernard and Thomas (1990) and Bhushan (1994) who report a negative association between the strength of the PEAD anomaly and firm-size. Notably, however, the results further reveal that not only is the hedge return for the largest firms (those in portfolios 9 and 10) small, it is also statistically insignificant.

In other words, no significant PEAD anomaly exists per average dollar of equity investment.

We also assess the reach and significance of the PEAD anomaly in groups of "small" vs. "large" firms, using different demarcation points to distinguish between the two groups. Specifically, we define large (small) firms as, alternately, the largest (smallest) 10% (90%), 15% (85%), 20% (80%) and 25% (75%) of the firms. The results, provided in panel B of table 4, show that the anomaly (as captured by the hedge return) is insignificant not only for the firms in the top 10% of the firm-size distribution (t-statistic of 0.67) but, collectively, for almost the entire group of firms in the top firm-size quartile. The change in significance occurs somewhere between the largest 20% and largest 25% of the firms with the largest 20% of the firms experiencing a portfolio return of 0.65% (t-statistic of 1.03) and the portfolio return for the largest 25% of the firms being almost double this at 1.16% (t-statistic of 2.10). Based on this, around 91% of the market value of the equity is not affected by the PEAD anomaly. Further, as reported on the last line of panel B of the table, when the means hedge return of the different size portfolios are weighted by the relative total market value of the portfolio, the PEAD anomaly is no longer significant for the full sample (a hedge portfolio return of only 0.91% with a t-statistic of 0.98.

The number of firms (and the fraction of the aggregate market value that they represent) subject to the anomaly is likely to be even smaller than the above analysis indicates. This is because some of the smaller firms may have a relatively rich information environment, attract attention from analysts, have a relatively

high proportion of institutional investors and more liquid stock. As mentioned earlier, Bartov et al. (2000) show indeed that at least one of the information environment indicators, the extent of institutional ownership, which captures investor sophistication, is negatively correlated with the magnitude of the abnormal return associated with the PEAD anomaly.

We examine the possibility that even smaller firms may be "immune" to the anomaly as long as they have a rich information environment. For this examination we characterize the information environment of each firm as having a "rich" or "poor" information environment based on four variables: (1) the number of analysts following the firm, (2) the percentage of institutional ownership, (3) the number of news reports and (4) the bid-ask spread. These variables are combined into a single factor through factor analysis. Using this variable, we characterize the firm as having a "rich" (above the median) or "poor" (below the median) information environment. We examine the presence and strength of the anomaly for the smallest 20% of the firms (those in firm-size deciles 1 and 2) based on their information environment.[10]

The results for the smallest 20% firms and, for comparison, also for the largest 20% firms, are presented in table 5. As expected, the smallest firms are mostly characterized as having a poor information environment (based on the factor derived from the four "informational variables.") Specifically, in the group of observations with a rich information environment, the smallest 20% of the firms are represented by only 584 observations as compared with a representation of 4,095 observations in this group of the 20% largest firms. These proportions are reversed for the group of observations with a poor information environment.[11] An examination of the hedge portfolio returns reveals that the PEAD

[10] We used also an alternative procedure whereby rank all firms according to, separately, each of the first three of the four "informational" variables, assigning a firm a score of 4, 3, 2 or 1 if it belongs to, respectively, to the first (highest values) quartile, second, third and fourth (lowest values) quartile in the distribution of the variable. For the bid-ask spread, we assign the score in a reverse order, that is, a score of 4 if the firm belongs to the fourth quarter (lowest bid-ask spread) of the distribution and 1 if it belongs to the first quartile. We then sum the scores to construct an "Information Environment Index." This index ranges from 4 to 16, with the lowest value indicating the strongest information environment and define firms above (below) the median index as having poor (rich) information environment. This procedure yields very similar results to those obtained from the factor analysis.

[11] Note that the sum of the number of observations with "Rich" and "Poor" information environment in table 5 is lower for the largest 20% firms than for the smallest 20% firms. The reason is that the hedge returns shown in the table are calculated only for extreme earnings surprises which are less common among the larger firms.

anomaly is insignificant even for very small firms when they operate in a rich information environment. This finding means that fewer firms – with an even smaller aggregate market value – are significantly affected by the anomaly than the number implied by the main analysis reported in table 4. Another finding is that large firms, even when they operate in what we characterize as a poor information environment are not affected by the anomaly. This finding suggests that firm size captures factors beyond the information variables considered in this analysis.

Note that smaller firms face higher transaction costs (see Mashruwala et al. 2006, Beneish et al. 2014). Therefore, the difference in the calculated hedge returns from the PEAD anomaly (as well as those from the other anomalies examined in this paper) between large and small firms could be, at least in part, a reflection of the difference in transaction costs between these groups of firms. Our objective in this paper is not to identify group of firms (e.g., small firms) in which trading opportunities exist to exploit these anomalies but rather assess the economic importance of the anomalies in terms of their distortive effect on resource allocation and market efficiency. In this sense, an anomaly which, for whatever reason (including transaction costs), significantly distorts the pricing of a group of firms, as reflected in a significant hedge-portfolio return, is not important economically if that group collectively represents only a tiny fraction of the aggregate value of the capital market.

6.2. The Accrual Anomaly

The results on the accrual anomaly by firm-size are presented in table 6. Panel A of the table exhibits the return from a hedge portfolio in which long (short) positions are held for firms whose signed accruals in the fiscal year are in the bottom (top) decile of the distribution of the year consisting of the 12 months starting with the fourth month of the following fiscal year.

As the table shows, smaller firms have a relatively high proportion of the extreme accruals. This is in line with the findings by Collins et al. (2003) and Lev and Nissim (2006). It also shows that the positive return from hedge portfolios based on the sign and magnitude of accruals decreases with firm-size from about 15% for firms in size deciles 1,2 and 3 (the smallest size deciles), to between 9% and 11% for firms

in the deciles 7,8 and 9. The portfolio return for portfolio 9 is smaller and only marginally significant and, interestingly, the return for portfolio 10 which consists of the largest firms is negative and statistically insignificant. So while the results presenting in the table confirm the significance of the anomaly when inferred for a pooled sample of equally-weighted observations (with a mean abnormal return of 10.40%, which is highly significance with a t-statistic of 8.22), at least 10% of the firms, the very largest firms which constitute most of the market value, are not affected by the anomaly at all.

Similar to our tests on the PEAD anomaly, we also assess the reach and significance of the accrual anomaly in groups of "small" and "large" firms using different demarcation points to define the two groups. The results provided in panel B of table 6 show that the anomaly as reflected in a significant hedge return) is insignificant for the combined group of firms at the top 20% to 25% of the firm-size distribution. These firms represent 90% to 92% of the total combined market value of equity of the sample firms (see table 1). Given these findings, the accrual anomaly is, not surprisingly, insignificant in the sample as a whole as indicated on the last line of the table.[12]

Given the strong association between firm-size and investor sophistication and on the extent of information about the firm, our finding regarding the absence of a significant accrual anomaly effect for the largest firms is consistent with the "behavioral" explanation offered for this anomaly which is generally linked to accounting fixation or investor sophistication. [13]

The insignificance of the abnormal return generated by exploiting the anomaly for firms that collectively represent close to 90% of the aggregate market value does not mean that the anomaly is not economically important

[12] The results reported above use the absolute value of net income to deflate accruals and size-adjusted returns. Use of total assets as a deflator for accruals and market- rather than size-adjusted returns, while producing lower hedge returns for the entire sample and for each size decile, lead to essentially the same inferences, except for the one pertaining to the complete disappearance of the anomaly, discussed below.

[13] Our results are inconsistent with Ali et al. (2000) and Cheng et al. 2012 who find that the anomaly affects all firm-size groups. Note, however, there is only nine years of overlap between Ali et al.'s 24-year test period and our test-period of 27 years. Further, Ali et al. use the balance sheet method to derive accruals (for lack of direct information on the cash flow from operations in the years of their sample). We use the direct measure of cash flow available now from the statement of cash flow. We replicate their study over the overlapping years (1987-1995) using the direct computation of accruals as the difference between net income and cash flow from operations. We find no significant accrual anomaly among the largest decile firms during that period. Cheng et al. (2012) do not examine separately the top decile portfolio. Replication of their work shows no significant accrual anomaly for this group of firms as well.

even for large firms. Aside from its prevalence (affecting the vast majority of firms), the statistically insignificant abnormal return generated by the anomaly for large firms is still sizeable. For example, the mean hedge portfolio return for the largest 20% of the firms is 4.41% (see panel B of table 6). This mean, while statistically insignificant, is arguably large enough to attract and affect trades of certain investors (e.g., risk lovers); in other words, it may be economically important.

6.2.1. Dissipation of the Accrual Anomaly

In a recent paper, Green et al. (2011) show that the accrual anomaly has dissipated over time to the point that, in recent years, it is no longer associated with significant abnormal returns. They attribute this decay in the anomaly's strength to arbitrage activities by hedge funds. This evidence, coupled with our finding of a lack of significance of the anomaly among large firms, raises two interesting questions: First, were large firms significantly affected by the anomaly in the early years? Second, has the dissipation in the power of the anomaly also occurred in smaller firms?

To examine these questions, we partition the sample period over which we examine the anomaly into two subperiods, 1987 to 2002 and 2003 to 2013, 2002 being the year in which the hedge return from the anomaly appears to have begun tapering off (see Figures 1 and 2 in Green et al. 2011). The results, presented in table 7, are consistent with the weakening of the anomaly as measured by the decline in the (simple) average hedge return from exploiting the anomaly.[14] The mean hedge return for our firm sample declined from 12.00% in the early subperiod 1987-2002 to 7.37% in the more recent subperiod 2003-2013. The hedge return declined for both small and large firms. However, the anomaly is still significant in recent years for the pooled sample. The table also shows that the largest 20% of the firms were not significantly affected by this anomaly even in the early sub-period. In fact, when the mean returns within firm-size deciles are weighted by the decile aggregate market value, the anomaly is insignificant in both the earlier and later subperiods (at -3.60% and 3.80%, respectively). These findings suggest the presence

[14] While we find that the anomaly has weakened over time, we do not find, as Green et al 2011 do, that its significance has completely disappeared. The difference in the findings is likely due their use of total assets as a deflator for accruals as opposed to the absolute value of net income as a deflator of accruals. When we replicate the results using total assets as a deflator, we obtain similar results to theirs.

of a learning process by investors that affected primarily small firms. In contrast, large firms are less likely to be affected by anomalies driven by functional fixation or lack of investor sophistication even in periods in which the existence of such anomalies is not well known to the public.

6.3. The Limited Attention Hypothesis

6.3.1 Muted Response to Earnings Announcements Made on Friday

The results regarding the firm-size effect on the investors' muted response to earnings announcements made on Friday are presented in table 8. One result in panel A of the table appears to confirm the anecdotal evidence that earnings announcements made on Friday are more likely to convey bad news than announcements made on other days of the week. The likelihood of releasing negative earnings news on Friday is 38% higher than the likelihood of releasing a positive earnings announcement on that day (4,318 as compared with 3,126). This is in contrast to the more balanced content of earnings announcement made on other days of the week which is, in fact, slightly more likely to be positive (48,303 compared to 47,085). This anecdotal evidence (validated by the empirical results in DellaVigan and Pollet 2009) led to the hypothesis that firms have an incentive to announce bad news on Friday because such news is likely to be partially ignored due to investors' limited attention on that day.

Interestingly, while our results are consistent with the notion of a concentration of bad earnings releases on Friday, this concentration exists only for announcements by small firms. There is no preponderance of bad earnings news among the largest 40% of the firms. This propensity is very pronounced among the small firms and, in particular, the smallest 10% of the firms for which the probability of releasing bad news is almost twice as high on Friday than on other days (1,001 compared to 552).

The findings also confirm the finding of DellaVigan and Pollet (2009) that Friday announcements elicit a weaker market response than non-Friday announcements. Specifically, as the table shows, the difference between the announcement period return associated with extreme good and bad earnings news (defined as the top and bottom quintiles of the earnings surprise distribution) is lower by 1.09% for

earnings announcements made on Friday than those made on non-Fridays for the overall sample, which is significant at a greater than 1% significance level. This lower response is present for all size portfolios although statistically significant for only about one-third of them.

More salient to our research question, however, is the finding that the muted market response to earnings on Friday (due presumably to limited attention) is confined to small firms. For the large firms, we do not observe a significant muted response to earnings announced on Friday.

Similar to our analysis of the PEAD and accrual anomalies, we test the maximum size group reached by the phenomenon of lack of attention to earnings announcements made on Friday. The results are presented in table 8, panel B. They show that the anomaly (as captured by the hedge return) is insignificant not only for the largest firms at the top 10% of the firm-size distribution but, collectively, for the entire group of firms at the top *quartile* of the firm-size distribution (a t-statistic of -1.09). This group represents about 92% of combined market value of the equity of the sample firms. Furthermore, when the mean hedge returns of the different size portfolios are weighted by the relative total market value of the portfolio, the inattention to earnings announcements made on Friday is not significant for the sample as a whole.

6.3.2. Inattention to Earnings Announcement Made During March Madness Games

Following Drake et al. 2015, we estimated regression (1) to test the difference in the market response to earnings announcements between announcements made during Thursday and Friday of the first round of the tournament and those made during a control period consisting of non-tournament dates. The differential response is captured by the coefficient of the interactive variable *EU*TourneyDay*. (See regression (1) described in section 5.3.2.) A negative coefficient suggests a weaker response to earnings announcements made on tournament days. The results are presented in table 9. Because of the relatively small number of announcements made on tournament days in our 15-year sample (413), we present the results by firm-size quintiles rather than deciles.

As reported on the first line of panel A of the table, the coefficient on the earnings surprise (UE), 0.070, is, as expected, positive and highly significant for the full sample and within each firm-size

quintile. Further, the coefficient on *UE*TourneyDay* is negative (-0.059) and significant, indicating a muted response to Friday announcements. When the results by quintiles are examined, it is further apparent that the response to response to earnings announcements made by large firms (quintile 5) is not affected at all by the distracting effect of contemporaneous NCAA tournament for investors' attention. However, it is not just the very largest firms that are oblivious to this effect. As seen in panel A, firms in the top three quintiles of the firm-size distribution (i.e., 60% of the firms) have a low and insignificant coefficient on the variable *UE*TourneyDay*, indicating that the response to these firms' tournament announcements is just as strong as that to announcements made on "normal," non-tournament, days. Only the smaller firms in quintiles 1 and 2 have a significantly weaker response to announcements made on tournament days. These firms represent only about 1.5% of the total market value of public firms in the main data bases (see table 1, panel B). This finding is reinforced by the results for firm-size groups provided in panel B table 9. As the panel shows, the response earnings announcements made by the group of the largest 60% on tournament days is not significantly weaker than the response of earnings announcement made on other days. This group of firms represent over 99% of the total market value of all firms covered by COMPUSTAT and CRSP.

6.3.3. Attention grabbing effect of "past winners"

The findings by Aboody et al. (2010) suggest that investor attention is drawn to recent "winners" and that this increased attention results in a temporary appreciation of the share price (which subsequently reverses). They also show that the abnormal return from the anomaly is lower for large stocks (defined as those with market capitalization above the 50th percentile of all NYSE stocks).

The results, by firm size deciles, which refer to the quarters in the years 1980-2013, are presented in table 10. This examination is based on the definition of "past winners" as those firm-quarters in the top decile of the distribution of the raw returns in the 12-month period preceding the end of the quarter.[15] Note that the frequency of "past winners" is higher among the smaller size deciles. Specifically, the

[15] The inferences are identical to those produced by defining past winners as firm-quarters in the top percentile of the distribution.

likelihood of firms in the first decile of the firm-size distribution (the smallest firms) to be a past winner is more than three times higher than that of firms in the top decile (the largest firms) (4,981 vs. 1,584 observations). This is not surprising given the higher return volatility (and a higher frequency of extreme returns) of small firms which would make them more likely to produce extreme return runs and thus past winners.

The table confirms the previous finding by showing that for the overall sample, past winners experience on average a positive, significant market-adjusted return (of 0.43%) in the five days ending with the quarterly earnings announcement. This positive abnormal return observed in the pre-announcement period of "winners" for the overall sample becomes smaller and less significant as the firm-size increases. It is 1.00% for firms in the first decile of the firm-size distribution (the smallest firms), and goes gradually down to 0.33% for the fifth decile and to 0.11% for the top decile (the largest firms). These results are consistent with the finding of Aboody et al. 2010 that the order imbalance in the pre-announcement period (and its reversal in the post-announcement period) is observed primarily among small-and medium-size trades (presumably initiated by small investors in small capitalization stocks). Our findings indicate however that none of the small positive returns shown for firms in the top three deciles is significant.

Table 10 shows that the "attention-grabbing" effect, if any, of stocks that have a recent run-up in price is concentrated in small firms and insignificant for large firms, at least among the largest 20% of the firms, which represent about 90% of the total market capitalization. Accordingly, when the mean return in each firm-size decile is weighted by the aggregate market value of the equity of firms in that decile, the resulting weighted return in the population is very low, 0.14%, and insignificant.

The results in both panels of table 10 show a significant reversal of the pre-announcement positive abnormal return in the post-announcement period consisting of the five days following the earnings announcement. The abnormal return in the post-announcement period is negative and significant for the entire sample (-0.77%) and for each firm-size decile. However, the significant reversal in and of itself does not necessarily indicate any "attention-grabbing power" of past winners. Instead, it could simply

represent a reversal of the extreme positive return over the combined period leading up to the quarterly earnings announcement.

6.4. Optimistic Bias in Analysts' Forecasts

The results of examining the optimistic bias in analysts' earnings forecasts are presented in tables 11 and 12. The results in these tables are based on a forecast error deflated by price and the use of the median error in the subsamples examined. The inferences are identical when the forecast error is deflated by the absolute value of actual earnings and means are used instead of medians.

Table 11 shows the prevalence of the bias, as captured by the relative frequency of firm-years with the early-in-the-year earnings forecast being above the actual EPS and the corresponding signed forecast error. Early-in-the-year forecasts are those outstanding at the beginning of the fourth month of the forecasted fiscal year. For the overall sample of 43,168 observations (over the period from 1991 to 2013), the actual EPS value exceeds the early forecast only in 43.93% of the observations, indicating an optimistic bias of these forecasts. The median forecast error (defined as the forecasted minus the actual values) is positive, 0.13%, also a reflection of an optimistic bias.

The breakdown by firm-size deciles reveals however that this bias is not common to all size groups. The early forecasts for smaller companies have a pronounced optimistic bias while those made for firms with above-median size (representing 98% of the aggregate market value of the equity of publicly traded firms) are, in fact, slightly pessimistic. Of the firms in the smallest –size decile only 24.84% are below the actual earnings number and accordingly have a positive median forecast error, 4.12%. In contrast, of the firms in the largest size decile most of the forecasts are below the actual, with the early forecasts having a median forecast error of -0.03%.

Panels A and B of table 12 present the progression of the bias over the forecasted year, from the beginning of the fourth month of the forecasted fiscal year to the beginning of the second month of the following fiscal year. Both measures of bias confirm the finding of past research of a "walk down," or downward revisions, in earnings expectations. The optimistic bias of the early months turns gradually into

a pessimistic bias as the year progresses, with no or even optimistic bias in the last four months of the 11-month examined period. This pattern, too, is affected by firm-size: The incidence of downward revisions is the highest among firms in the lowest decile of the firm-size distribution. This group of firms shows a sharp increase in the relative frequency of observations for which actual earnings exceed the forecasted number, from 24.84% early in the forecast period to 43.86% at its end (see panel A), ending the forecast period with a median forecast error that is very close to zero (see panel B), indicating no or only slight pessimistic bias. In contrast, the frequency of forecasts below actual earnings in the top firm-size decile increases only slightly over the year, with no discernible change in the forecast error. The common explanation for the walk down trend in expectations during the year and the prevalence of cases of meeting or beating expectations is that of expectation management. The frequency of instances in which companies meet or beat analyst forecasts is also explained by earnings management. Our finding of more frequent downward revisions in analyst forecasts among small firm can thus be explained by the fact that smaller firms are followed by fewer analysts and have more limited public information about them. As a result, their investors and analysts are more susceptible to expectation management and less likely to detect earnings management, making these managerial courses of action more effective and less costly to the firms.

7. Summary and Concluding Remarks

In this study we propose another perspective for assessing the importance of various market anomalies, namely, the extent of the invested capital affected by the anomaly. We examine a number of well-known anomalies whose existence is attributed to factors relating to the information environment, investor sophistication and cognitive biases. We find that while many or even most firms are affected by these anomalies, they are typically smaller firms whose aggregate market value is less than10% of the total market value of public firms. Specifically, the groups of firms significantly affected by the PEAD and accrual anomaly represent about 8% to 10% of the aggregate market value of equity of publicly traded firms. Various manifestations of limited attention are significant for firms that represent

(depending on the specific manifestation) between 1% and 8% of that aggregate market value. We also find that optimistic bias in analyst earnings forecasts made early in the year is present only for the group of firms below median size (representing less than 2% of the aggregate market value of equity) The strong influence that firm-size has on the effect of the anomaly is consistent with the information and behavioral-related explanations for these anomalies (as opposed to risk mis-measurement).

These findings suggest that the distortive effect of these anomalies on resource allocation is limited, which has implications for researchers, investors and regulators. The limited reach of the anomalies in terms of the market value affected by them does not mean, of course, that those anomalies are not important or that their analysis does not expand our knowledge on investor behavior and the operation of the capital markets. After all, most of these anomalies affect the stock price of the majority of firms. Further, the abnormal return of large firms from exploiting the anomalies, while statistically insignificant, is positive for most of the anomalies and even fairly large for the accrual anomaly. This suggests that these returns may be economically important in terms of their effect on the investment decisions of investors. The message of this paper is, however, that it would be insightful for any study of an anomaly (or irregular price behavior) to provide an additional important dimension of the anomaly, namely, its market–value reach. Further, given the finding that larger firms are immune to anomalies stemming from factors relating to investor sophistication or cognitive biases, studies on such factors would be more insightful, efficient and powerful when focused on small firms.

Figure 1A: Cumulative Fraction of Total Market Value Represented by the X% Largest Firms
Available on both COMPUSTAT, CRSP, IBES and Execucomp
(as of the end of 2013 fiscal year)

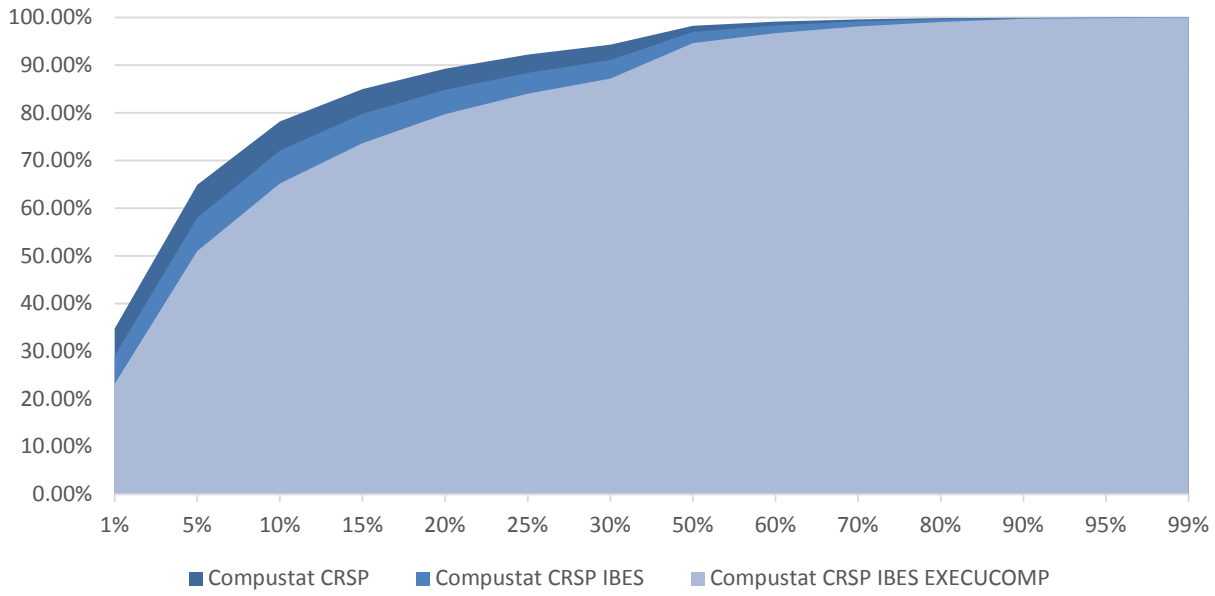

Figure 1B: Cumulative Fraction of Total Market Value Represented by the X% Smallest Firms
Available on both COMPUSTAT, CRSP, IBES and Execucomp
(as of the end of 2013 fiscal year)

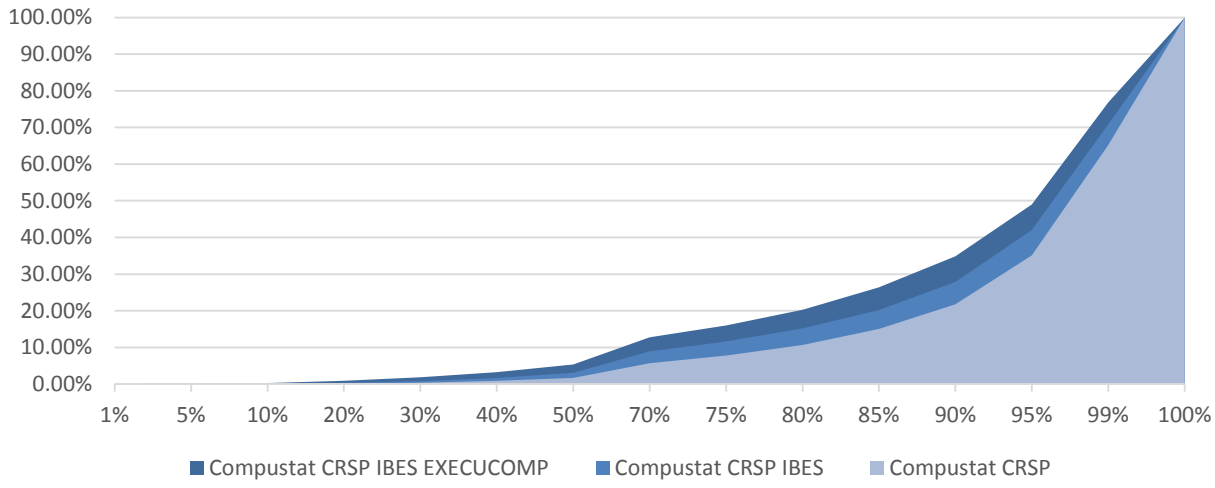

Table 1: Firm Coverage on Financial Databases by Year[a]

	Number of Firms Covered [b]		
Fiscal Year	COMPUSTAT	CRSP	I/B/E/S
1950	665	1,026	.
1960	2,127	1,154	.
1970	4,222	2,560	.
1980	6,889	5,549	2,071
1990	9,571	7,408	3,980
2000	12,091	9,321	6,354
2010	11,051	7,143	4,905
2013	11,187	7,214	4,925
2014	Incomplete	7,417	4,875

[a] The number of firms each year refers to the number of firms with data for that year.
[b] COMPUSTAT was initiated in 1962; CRSP began in 1960; I/B/E/S started in 1976.

Table 2: Measures of Firm-Size Inequality by Year on the COMPUSTAT and CRSP databases

Fiscal Year	Ratio of the aggregate market value of equity of firms:		Ratio of the demarcation points of the firm-size distribution:	
	in the largest and the smallest 10% of the firms	in the largest and the smallest 20% of the firms	of the 10th and 1st deciles	of the 5th and 1st quintiles
1950	181	76	39	11
1960	322	121	61	17
1970	514	193	99	22
1980	1,089	354	160	29
1990	2,683	770	269	38
2000	3,349	924	241	37
2010	1,818	493	203	34
2013	2,487	610	259	41
2014	3,846	788	375	49

Table 3: Descriptive Statistics on the Firm-Size Distribution as of the end of Fiscal Year 2013

Panel A: Cumulative % of Firms on Databases Presented from Largest Firms to Smallest Firms

Cumulative % of Firms on Database)	Cumulative % of Aggregate Market Value		
	COMPUSTAT and CRSP (N = 6,531)	COMPUSTAT, CRSP and I/B/E/S (N = 3,470)	COMPUSTAT, CRSP, I/B/E/S and EXECUCOMP (N = 1,538)
1% largest firms	34.98%	29.08%	22.17%
5%	64.93%	57.92%	51.00%
10%	78.23%	72.10%	65.16%
15%	85.01%	79.82%	73.63%
20%	89.31%	84.82%	79.73%
25%	92.22%	88.37%	84.03%
30%	94.29%	91.07%	87.17%
50%	98.30%	96.97%	94.66%
60%	99.12%	98.36%	96.84%
90%	99.97%	99.91%	99.74%
100%	100.0%	100.0%	100.0%

Panel B: Cumulative % of Firms on Databases Presented from Smallest to Largest Firms

	Cumulative % of Aggregate Market Value		
Cumulative % of Firms on Database	COMPUSTAT and CRSP (N = 6,531)	COMPUSTAT, CRSP and I/B/E/S (N = 3,470)	COMPUSTAT, CRSP, I/B/E/S and EXECUCOMP (N = 1,538)
10% smallest firms	0.03%	0.09%	0.26%
40%	0.88%	1.64%	3.26%
50%	1.70%	3.03%	5.34%
70%	5.71%	8.93%	12.83%
75%	7.78%	11.63%	15.97%
80%	10.69%	15.18%	20.27%
85%	14.99%	20.18%	26.37%
90%	21.77%	27.90%	34.84%
95%	25.07%	42.08%	48.00%
99%	65.02%	70.92%	77,83%
100%	100.00%	100.0%	100.0%

Table 4: Post-Earnings-Announcement Drift: Return to Hedge Portfolios[a]
Panel A: By Firm-Size Deciles

Firm-size decile	Number of observations in the most extreme 10% earnings surprise portfolios[b]		Hedge portfolio return[c]	t-statistic
	Positive earnings surprises	Negative earnings surprises		
All firm-quarters	**32,655**	**32,860**	**5.04%**	**20.07**
1 (smallest firms)	5,354	6,026	7.03%	8.93
2	4,662	5,279	8.98%	11.44
3	4,155	4,692	6.34%	7.67
4	3,795	3,871	4.58%	7.45
5	3,206	3,404	3.80%	4.53
6	2,991	2,864	3.02%	3.67
7	2,656	2,294	2.68%	2.77
8	2,451	1,920	2.70%	2.81
9	1,999	1,540	0.67%	1.11
10 (largest firms)	1,386	970	0.64%	1.22

[a] Quarterly observations over the 1983-2013 period are used in this table. Firm-size portfolios are formed at the beginning of each year based on the distribution of the market value of equity of the firms.

[b] Earnings surprise portfolios are formed based on the distribution of the earnings surprise for all firms in the quarter. The quarterly earnings surprise is defined as the difference between the actual quarterly earnings-per-share (EPS) and the median EPS forecast for the quarter available immediately prior to the earnings announcement, with the difference deflated by the share price at the end of the reported quarter. Stale forecasts (those that are older than 90 days) are removed from the computation of the median forecasts.

[c] The hedge portfolio returns are computed for each firm-quarter as the abnormal return over the 60-day period commencing on the second day after the quarterly earnings announcement. The abnormal return is computed as the difference between the compounded daily stock return over this 60-day period and the compounded market return during that period.

Table 4: Post-Earnings-Announcement Drift: Return to Hedge Portfolios (continued)[a]
Panel B: By Various Size Groups

Size Groups	Hedge portfolio return[c]	t-statistic	% of total market value represented by the size-group
All firm-years	5.04%	20.07	100.00%
Smallest 90%	5.20%	20.15	21.52%
Largest 10%	0.64%	0.67	78.48%
Smallest 85%	5.37%	20.26	14.99%
Largest 15%	0.84%	1.11	85.01%
Smallest 80%	5.47%	20.30	10.10%
Largest 20%	0.65%	1.03	89.09%
Smallest 75%	5.64%	20.25	7.78%
Largest 25%	1.16%	2.10	92.22%
Smallest 70%	5.71%	20.02	5.57%
Largest 30%	1.54%	3.20	94.03%
Value-Weighted Observations[d]	0.91%	0.98	100.00%

[d] The value-weighted return is computed by weighting the mean hedge return of each decile by the market value of this portfolio. The market value of the portfolio consists of the sum of the market value of equity of firms in that portfolio as reported on COMPUSTAT at the end of 2013. (Using weights based on distributions in other yearends has negligible effect on the results.) The t-statistic is based on the value-weighted variance.

Table 5: Post-Earnings-Announcement Drift: Comparison between Firms with Rich and Poor Information Environments[a]

Firm-Size Groups	Information Environment[b]					
	Poor			Rich		
	No. of observations	Hedge portfolio return	t-statistic	No. of observations	Hedge portfolio return	t-statistic
Smallest 20%	4,095	7.03%	6.74	584	3.68%	1.14
Largest 20%	353	0.38%	0.17	2,479	0.66%	0.60

[a] Quarterly observations over the 1983-2013 period are used in this table. The number of observations in the table is the number upon which the hedge portfolio return is based (which is the number of observations with an extreme earnings surprise).

[b] Characterization of the information environment as "rich" or "poor" is based on a variable derived by factor analysis that combines the following variables: the number of analysts following the firm, proportion of institutional ownership, the number of firm-related news reports and the firm's bid-ask spread (see section 6.1 for details). Firms with an above (below) the median value on this combined variable are characterized as having a rich (poor) information environment.

Table 6: Return to Accrual-Based Hedge Portfolios, By Firm Size

Panel A: By Firm-Size Deciles[a]

Firm-Size Portfolio[b]	Firm-years with Extreme:[c]		Hedge portfolio return[d]	t-statistic
	Positive accruals	Negative accruals		
All firm-years	9,919	9,914	10.40%	8.22
1 (smallest firms)	1,275	938	14.00%	2.84
2	1,357	980	14.30%	2.71
3	1,340	1,080	15.70%	4.46
4	1,220	1,098	9.40%	2.54
5	1,216	1,079	10.50%	3.54
6	1,104	1,011	9.87%	3.48
7	922	981	11.00%	3.28
8	755	944	11.00%	4.13
9	491	929	8.66%	1.89
10 (largest firms)	239	874	-3.09%	-0.27

[a] This table consists of annual observations over the 1987-2013 period.

[b] Firm-size portfolios are formed each year by dividing firms into deciles based on the market value of equity at the beginning of the year.

[c] *Accruals* are defined as Net Income from Continuing Operations minus Cash Flow from Operations, deflated by the absolute value of Net Income. *Extreme accruals* are those in the top or bottom deciles of the signed accruals measure.

[d] *The hedge portfolio return* is the difference between the size-adjusted abnormal return of observations at the bottom decile and those at the top decile of distribution of the signed accruals, compounded over a 12-month holding period starting with the fourth month following the fiscal year. Size-adjusted returns over a period are obtained by subtracting the compounded return on the size benchmark from the compounded return of the individual stock.

Table 6: Return to Accrual-Based Hedge Portfolios, By Firm Size (continued)

Panel B: By Various Size Groups

Size Groups	Hedge portfolio return	t-statistic	% of total market statistic represented by the size-group
All firm-years	10.40%	8.22	100.00%
Smallest 90%	11.20%	8.63	21.52%
Largest 10%	-3.09%	-0.27	78.48%
Smallest 85%	11.40%	8.59	14.99%
Largest 15%	0.06%	0.01	85.01%
Smallest 80%	11.60%	8.42	10.10%
Largest 20%	4.44%	1.07	89.09%
Smallest 75%	11.80%	8.23	7.78%
Largest 25%	5.90%	1.96	92.22%
Smallest 70%	11.90%	7.92	5.57%
Largest 30%	7.65%	3.17	94.03%
Value-Weighted Observations[(e)]	-0.32%	-0.03	100.00%

[(e)] The value-weighted return is computed by weighting the mean hedge return of each decile by the market value of this portfolio. The market value of the portfolio consists of the sum of the market value of equity of firms in that portfolio as reported on COMPUSTAT at the end of 2013. (Using weights based on distributions in other yearends has negligible effect on the results.) The t-statistic is based on the value-weighted variance.

Table 7: Return to Accrual-Based Hedge Portfolios, By Firm Size: Comparison between Segments of the Population by Firm-Size in 1987-2002 and in 2003-2013

	1987-2002		2003-2013	
Size Groups	Hedge portfolio return	t-statistic	Hedge portfolio return	t-statistic
All firm-years	12.00%	9.90	7.37%	4.37
Smallest 90%	13.00%	7.40	7.77%	4.44
Largest 10%	-8.06%	-0.43	3.52%	0.90
Smallest 80%	13.30%	7.18	8.20%	4.38
Largest 20%	5.21%	0.77	3.13%	1.24
Smallest 70%	13.70%	6.80	8.22%	4.07
Largest 30%	8.67%	2.47	5.92%	2.61
Value-Weighted Observations[(a)]	-3.60%	-0.22	3.80%	0.97

[(a)] The value-weighted return is computed by weighting the mean hedge return of each decile by the market value of this portfolio. The market value of the portfolio consists of the sum of the market value of equity of firms in that portfolio as reported on COMPUSTAT at the end of 2013. (Using weights based on distributions in other yearends has negligible effect on the results.) The t-statistic is based on the value-weighted variance.

Table 8: The Friday Anomaly [(a)]
Panel A: By Firm-Size Deciles

Firm-size decile[(b)]	Number of earnings announcements made on:				Hedge portfolio return[(d)]			
	Friday		Non-Friday					
	Extreme positive surprises[(c)]	Extreme negative surprises	Extreme positive surprises	Extreme negative surprises	Friday	Non-Friday	Difference	t-statistic
All firm-quarters	3,126	4,318	48,303	47,085	5.19%	6.28%	-1.09%	-4.66
1 (smallest firms)	552	1,001	8,232	8,455	5.48%	5.80%	-0.32%	-0.51
2	433	673	6,788	7,100	4.54%	6.22%	-1.68%	-2.72
3	392	537	6,133	5,134	6.08%	7.05%	-0.97%	-1.33
4	306	465	5,438	5,373	6.29%	7.04%	-0.75%	-1.08
5	275	355	4,729	4,821	5.60%	7.24%	-1.65%	-2.15
6	254	320	4,382	4,123	5.73%	6.70%	-0.97%	-1.40
7	263	280	4,000	3,643	4.83%	6.35%	-1.52%	-2.04
8	256	285	3,457	3,068	4.33%	5.41%	-1.08%	-1.67
9	216	221	2,896	2,560	3.99%	5.00%	-1.01%	-1.66
10 (largest firms)	179	181	2,248	1,808	4.19%	3.92%	0.27%	0.37

[(a)] Quarterly observations from 1995 through 2014 are used in forming this table.

[(b)] *Firm size* deciles are determined annually based on the market value of equity at the beginning of the year.

[(c)] *Earnings surprise* is defined as the difference between actual quarterly earnings-per-share (EPS) and the median EPS forecast for the quarter available immediately prior to the earnings announcement, deflated by the share price at the end of the reported quarter. *Extreme positive (negative) earnings surprises* are those in the top (bottom) quintile of the distribution of quarterly earnings surprises in the fiscal year.

[(d)] *The return on a hedge portfolio* is the market-adjusted return from a strategy in which long (short) positions are held in stocks with extreme positive (negative) quarterly earnings surprises over the two-day period consisting of the announcement day and the following day.

Table 8: The Friday Anomaly (continued)
Panel B: By Various Size Groups

Size Groups	Difference in hedge return between Friday and Non-Friday announcers	t-statistic	% of total market value represented by the size-group
All firm-years	-1.09%	-4.66	100.0%
Smallest 90%	-1.13%	-4.44	21.52%
Largest 10%	0.27%	-1.00	78.48%
Smallest 85%	-1.18%	-4.75%	14.99%
Largest 15%	0.28%	0.45%	85.01%
Smallest 80%	-1.13%	-4.14	10.10%
Largest 20%	-0.75%	-1.94%	89.09%
Smallest 75%	-1.16%	-4.37	7.78%
Largest 25%	-0.46&	-1.09	92.22%
Smallest 70%	-1.13%	-4.14	5.57%
Largest 30%	-0,75	-1.94	94.03%
Value-Weighted Observations[(e)]	-0.32%	-0.03	100%

[(e)] The value-weighted return is computed by weighting the mean hedge return of each decile by the market value of this portfolio. The market value of the portfolio consists of the sum of the market value of equity of firms in that portfolio as reported on COMPUSTAT at the end of 2013. (Using weights based on distributions in other yearends has negligible effect on the results.) The t-statistic is based on the value-weighted variance.

Table 9: Muted Response to Earnings Announcements Made during March Madness: Main Results from Regression (1):

AR = f {year and industry fixed effects, *TourneyDay*, *UE*, *UE * TourneyDay*)[(a)]

Panel A: By Firm-Size Quintiles

Firm-size portfolio[(b)]	N (No. of announcements)	Coefficient of *Tourney*	t-statistic	Coefficient of *UE*	t-statistic	Coefficient of *UE*TourneyDay*	t-statistic	Adj. R^2
All firm-years*	20,020	0.014	3.27	0.070	37.20	-0.059	-4.95	6.7%
1 (smallest firms)	3,984	0.002	0.18	0.066	16.53	-0.050	-2.27	6.6%
2	4,008	0.041	3.95	0.078	16.53	-0.127	-4.65	7.3%
3	4,024	0.008	0.78	0.081	17.97	-0.045	-1.57	7.4%
4	4,008	0.012	1.12	0.069	16.64	-0.007	-0.19	7.0%
5 (largest firms	4,000	0.008	1.16	0.054	14.91	0.010	0.35	5.5%

[(a)] The regression for all firm-years is estimated from a pooled sample of 22,064 firm-year announcements. Of these, 392 occur on the tournament date (test period). *AR* is the abnormal return during the announcement period computed as the size-adjusted return over the two-day period consisting of the days 0,1 relative to the announcement day. *UE* is the normalized unexpected earnings computed by ranking the earnings surprise (as defined in 5.1), each year into deciles and assigning the deciles to a range between -0.5 to +0.5. The scaled ranked value of 0 corresponds to firms with earnings surprises at the sample median. *TourneyDay* is an indicator variable that receives the value of 1 if the announcement occurs during the first round game days and 0 otherwise. Days in the control period are Thursday or Friday in days that fall either in February or March prior to the day (Thursday) on which the tournament begins, or after April 11.

[(b)] Firm-size portfolios (quintiles) are formed once a year based on the distribution of the market value of equity of the firms at the beginning of the year.

Table 9: Muted Response to Earnings Announcements Made during March Madness (continued): Main Results by Firm-Size from Regression (1):
AR = f {year and industry fixed effects, *TourneyDay*, *UE*, *UE * TourneyDay*)

Panel B: By Various Size Groups

Firm-size portfolio	Coefficient of *Tourney*	t-statistic	Coefficient of *UE*	t-statistic	Coefficient of *UE*TourneyDay*	t-statistic	Adj. R^2
All firm-years	0.014	3.27	0.070	37.20	-0.059	-4.95	6.7%
Smallest 80%	0.015	3.08	0.073	33.82	-0.067	-5.02	6.9%
Largest 20%	0.008	1.16	0.054	15.01	0.009	0.34	5.6%
Smallest 60%	0.015	2.71	0.074	29.29	-0.072	-4.90	7.0%
Largest 40%	0.009	1.51	0.062	22.38	-0.001	-0.03	6.2%
Smallest 50%	0.019	3.16	0.072	26.25	-0.077	-4.91	6.8%
Largest 50%	0.005	0.86	0.067	26.24	-0.003	-0.13	6.6%
Smallest 40%	0.019	2.78	0.071	23.33	-0.081	-4.69	6.8%
Largest 60%	0.008	1.57	0.069	28.97	-0.022	-1.22	6.7%

Table 10: Attention to "Past Winners": Results by Firm-Size Portfolio[a]
Panel A: By Firm-Size Deciles

Firm-size decile[b]	Number of "past winners"[c]	Abnormal return over the 5-day period ending with the earnings announcement[d]	t-statistic	Abnormal return over the 5-day period following the earnings announcement[d]	t-statistic
All firm-quarters	33,384	0.43%	9.25	-0.77%	-15.79
1 (smallest firms)	4,981	1.00%	7.24	-1.32%	-9.46
2	4,311	0.51%	3.79	-0.72%	-5.20
3	4,234	0.25%	1.87	-0.81%	-5.69
4	3,917	0.37%	2.75	-0.88%	-5.89
5	3,613	0.33%	2.34	-0.47%	-3.22
6	3,197	0.30%	2.17	-0.61%	-3.92
7	2,882	0.39%	2.69	-0.54%	-3.42
8	2,512	0.25%	1.59	-0.58%	-3.49
9	2,153	0.21%	1.47	-0.62%	-4.15
10 (largest firms)	1,584	0.11%	0.62	-0.65%	-3.96

[a] The table is based on quarterly observations from 1980 to 2013.

[b] Firm-size portfolios are formed at the beginning of each year based on the distribution of the market value of equity of the firms.

[c] Recent winners are firm-quarters at the top decile of the distribution of the raw returns over the 12-month period prior to the quarter-end. This distribution is determined separately for each quarter

[d] The mean abnormal returns across firms in each portfolio are provided.

Table 10: Attention to "Past Winners": Results by Firm-Size: Comparison between Groups of Different Firm-Size (continued)

Panel B: By Various Size Groups

Firm-size decile	Abnormal return over the 5-day period ending with the quarterly earnings announcement	t-statistic	Abnormal return over the 5-day period following earnings announcement	t-statistic
Smallest 90%	0.44%	9.28	-0.77%	-15.36
Largest 10%	0.11%	0.62	-0.65%	-3.96
Smallest 85%	0.45%	9.29	-0.78%	-15.10
Largest 15%	0.12%	0.87	-0.65%	-4.88
Smallest 80%	0.46%	9.17	-0.78%	-14.83
Largest 20%	0.17%	1.52	-0.63%	-5.72
Smallest 75%	0.46%	8.96	-0.79%	-14.67
Largest 25%	0.24%	2.38	-0.61%	-5.96
Value-Weighted Observations [(e)]	0.14%	0.84	-0.64%	-3.95

[(e)] The value-weighted return is computed by weighting the mean hedge return of each decile by the market value of this portfolio. The market value of the portfolio consists of the sum of the market value of equity of firms in that portfolio as reported on Compustat at the end of 2013. (Using weights based on distributions in other yearends has negligible effect on the results.) The t-statistic is based on the value-weighted variance.

Table 11: Bias in Analysts' Early Annual Forecasts of Earnings by Firm-Size Decile

Firm-size decile	Percentage of firms for which the actual EPS value is above the early forecast	Signed Forecast Error [(a)]
All firm-years (N=43,168)	43.93%	0.13%
1 (smallest firms)	24.84%	4.12%
2	31.95%	1.25%
3	36.70%	0.60%
4	42.50%	0.24%
5	46.04%	0.08%
6	48.70%	0.00%
7	51.54%	-0.04%
8	51.83%	-0.03%
9	51.57%	-0.02%
10 (largest firms)	53.55%	-0.03%

[(a)] *Forecast error* is defined as the consensus analyst earnings-per-share forecast made at the beginning of the fourth month of the fiscal year minus the actual earnings number, deflated by the stock price at the beginning of the year. Median signed forecast errors are presented in the table.

Table 12: Progression of Bias in Analysts' Annual Earnings Forecasts during the Fiscal Year by Firm-Size Decile

Panel A: Percentage of Firms in Which Actual EPS Exceeds the Forecast

Firm-size deciles	Month in the fiscal year									Month in the following fiscal year	
	4th	5th	6th	7th	8th	9th	10th	11th	12th	1st	2nd
All firm-years (N=43,168)	43.93%	43.91%	44.13%	44.69%	45.33%	46.15%	48.37%	50.06%	51.70%	54.86%	56.26%
1 (smallest firms)	24.84%	25.15%	25.52%	26.63%	28.35%	29.63%	31.79%	35.52%	37.71%	42.03%	43.86%
2	31.95%	32.35%	32.92%	34.24%	35.36%	36.33%	38.99%	41.82%	43.83%	47.47%	49.55%
3	36.70%	37.07%	37.86%	38.64%	39.43%	40.50%	43.16%	45.71%	47.65%	51.03%	52.51%
4	42.50%	42.91%	43.24%	43.61%	44.72%	45.39%	47.73%	49.31%	51.11%	54.01%	55.98%
5	46.04%	45.69%	45.74%	46.62%	46.66%	47.85%	50.30%	51.48%	53.04%	56.77%	57.39%
6	48.70%	48.57%	48.24%	48.17%	48.61%	49.65%	52.55%	53.80%	55.83%	58.68%	59.42%
7	51.54%	51.12%	51.24%	52.03%	52.58%	53.25%	55.82%	56.77%	57.76%	59.73%	61.40%
8	51.83%	51.51%	51.41%	51.30%	51.51%	52.27%	54.54%	55.61%	57.02%	60.64%	62.10%
9	51.57%	51.74%	51.92%	52.71%	52.48%	52.96%	55.14%	56.57%	57.45%	61.31%	62.38%
10 (largest firms)	53.55%	53.02%	53.18%	52.93%	53.60%	53.62%	53.62%	54.02%	55.59%	56.94%	57.96%

Table 12: Progression of Bias in Analysts' Annual Earnings Forecasts during the Fiscal Year by Firm-Size Decile (continued)

Panel B: Signed Forecast Error[(a)]

Firm-size deciles	Month in the current fiscal year									Month in the following fiscal year	
	4th	5th	6th	7th	8th	9th	10th	11th	12th	1st	2nd
All firm-years (N=43,168)	0.13%	0.12%	0.10%	0.06%	0.04%	0.03%	0.00%	0.00%	-0.02%	-0.03%	-0.04%
1 (smallest firms)	4.12%	3.70%	3.22%	2.53%	2.00%	1.71%	1.14%	0.63%	0.40%	0.16%	0.00%
2	1.25%	1.08%	0.97%	0.78%	0.56%	0.45%	0.25%	0.12%	0.05%	0.00%	0.00%
3	0.60%	0.51%	0.47%	0.32%	0.24%	0.20%	0.08%	0.00%	0.00%	-0.03%	-0.04%
4	0.24%	0.20%	0.18%	0.13%	0.07%	0.06%	0.00%	0.00%	-0.02%	-0.04%	-0.05%
5	0.08%	0.10%	0.08%	0.05%	0.03%	0.00%	-0.01%	-0.02%	-0.03%	-0.05%	-0.05%
6	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.03%	-0.03%	-0.04%	-0.05%	-0.05%
7	-0.04%	-0.02%	-0.03%	-0.03%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.05%	-0.05%
8	-0.03%	-0.03%	-0.03%	-0.02%	-0.02%	-0.03%	-0.03%	-0.03%	-0.04%	-0.04%	-0.05%
9	-0.02%	-0.03%	-0.03%	-0.03%	-0.03%	-0.03%	-0.03%	-0.03%	-0.03%	-0.04%	-0.04%
10 (largest firms)	-0.03%	-0.03%	-0.03%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%

[(a)] *Forecast error* is defined in this table as the consensus analyst earnings-per-share forecast made at the beginning of the fourth month of the fiscal year minus the actual earnings number, deflated by the stock price at the beginning of the year. Stale forecasts (those that are older than 90 days) are removed. Median signed forecast errors are presented in the table.

APPENDIX
Indicators of the Extent of Information, Investor Sophistication and Liquidity by Firm-Size Deciles[(a)]

Firm-Size Decile	Number of Firms	Number of Analysts Following the Firm	Proportion of Institutional Ownership	Number of Firm-Related News Reports	Monthly Volume ($ million)	Ownership Concentration	Bid-Ask Spread
All firms	3,365	6	0.63	442	169	0.060	0.0068
1 (smallest firms)	336	2	0.29	171	6	0.156	0.0123
2	337	3	0.46	241	20	0.096	0.0099
3	336	4	0.55	294	38	0.074	0.0089
4	337	5	0.64	348	87	0.066	0.0079
5	336	6	0.70	426	136	0.058	0.0072
6	337	8	0.73	465	219	0.054	0.0062
7	337	9	0.76	560	374	0.051	0.0059
8	336	11	0.74	630	693	0.047	0.0051
9	337	16	0.74	945	1,534	0.041	0.0048
10 (largest firms)	336	20	0.59	1,887	3,153	0.039	0.0041

[(a)] The sample consists of firms on COMPUSTAT, CRSP and I/B/E/S as of fiscal year 2013. Firms included in this table are those for which all "information variables" (except the number of news items) are available in 2013. (Reproducing this table for each individual variable for which all firms were available resulted in the same patterns and conclusions.) Median values are reported in the table.

Firm size deciles are computed based on the market value of equity at the end of 2013.
Number of analysts following the firm: Number of analysts' estimates for fiscal year 2014 comprising the consensus forecast as of the third month after fiscal 2013.
Proportion of ownership held by institutional investors: Measured at December 2013.
Number of firm-related news reports: Number of news articles citing the firm in Dow Jones Newswires, regional editions of the Wall Street Journal, Barron's and MarketWatch as provided in RavenPack News Analytics – Dow Jones Edition.
Monthly volume: Average of the monthly volumes for 2013.
Ownership Concentration: Based on the Herfindahl-Hirschman Index.
Bid-ask spread: Average monthly bid-ask spread, computed based on Corwin and Schultz (2012).

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