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What do measures of real-time corporate sales say about earnings surprises and post-announcement returns?☆

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ABSTRACT

We develop real-time proxies of retail corporate sales from multiple sources, including ~50 million mobile devices. These measures contain information from both the earnings quarter ("within quarter") and the period between the quarter-end and the earnings announcement date ("post quarter"). Our within-quarter measure is powerful in explaining quarterly sales growth, revenue surprises, and earnings surprises, generating average excess announcement returns of 3.4%. However, our post-quarter measure is related negatively to announcement returns and positively to post-announcement returns. When post-quarter private information is positive, managers, at announcement, provide pessimistic guidance and use negative language. This effect is more pronounced when, post-announcement, management insiders trade. We conclude that managers do not fully disclose their private information and instead bias their disclosures down when in possession of positive private information. The data suggest that they could be motivated in part by subsequent personal stock-trading opportunities.

1. Introduction

The information asymmetry around earnings announcements has long been near the center of finance and accounting research. At the time of an earnings announcement, managers have information not only about their firm's performance over the last accounting quarter ("within quarter") but also about performance since the quarter-end ("post quarter"). The announced numbers and the accounting disclosures they rely on help remove within-quarter information asymmetries between managers and external market participants. But these accounting disclosures cannot, by definition, eliminate any post-quarter information asymmetries that managers could possess. Additional tools—discretionary accruals included in the accounting disclosures, formal guidance, and informal call tone—have therefore evolved wherein managers have the opportunity to convey post-quarter information in the current, instead of the next, quarterly announcement. Are these discretionary tools, whose transmitted content is difficult for shareholders to verify, used in the interests of

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shareholders, as intended, or could they instead be used against shareholders, in the interests of managers?

This is the question we ask in this paper. We gain some edge in answering it by constructing proxies for managers' within-quarter and post-quarter internal corporate information around earnings announcements. These proxies are real-time measures of sales activity covering both within- and post-quarter periods, right up until the announcement date, typically four to six weeks after quarter-end. The proxies are constructed from multiple big-data sources that provide real-time information about consumer sales at US retailers.

To construct our firm-level real-time corporate sales indexes, we estimate the amount of consumer activity at retail stores approximately in real time, utilizing proprietary data sources. An example would be the data we collect from approximately 50 million mobile phones, as well as tablets and desktops, pertaining to consumer activity at large US retailers.[1] We focus on US retail firms whose main revenue source comes from their own retail stores. Using this underlying information, we derive two indexes, one measuring within-quarter sales activity, denoted by *WQS*, and the other measuring post-quarter sales activity up until the announcement date, denoted by *PQS*.

For a given firm in a given quarter, *WQS* and *PQS* are the growth rates of consumer activity, defined as a data event associated with consumer intention to visit a particular retail store. They are determined by taking the log difference between the number of events aggregated over the given quarter and the quarterly average of the number of events over quarters $t-1$ to $t-4$.

The innovation here is twofold. First, we are capturing firm-specific real-time economic activity that tracks consumer activity. Our information is distinct from that derived from social media (e.g., Chen, De, Hu, and Hwang, 2014). Because it seeks to measure actual consumer activity, not from derived opinions or sentiment, it is likely more tightly linked to underlying sales fundamentals. Second, because a firm's managers likely have access to up-to-date information on the firm's operations, our *WQS* and *PQS* indexes are, at the time of announcement, useful proxies for managers' private information.

We first demonstrate that the *WQS* index is related to previously unannounced within-quarter fundamentals. We find that *WQS* significantly predicts current-period revenue growth, announcement surprises, and analyst forecast errors. For example, the R^2 from a regression of quarterly revenue growth on *WQS* is 39%. Also, the average announcement excess return for stocks in the highest quintile of *WQS* is 2.14% and that for stocks in the lowest quintile is −1.26%, resulting in an economically significant return differential of 3.4% for the five-day period around earnings announcement dates. Our information, therefore, is strongly correlated with previously unannounced within-quarter sales. These predictions are not surprising. They merely confirm that our novel information, embedded in both *WQS* and *PQS*, is potent.

Next, we study the *PQS* relation with post-announcement returns, discretionary accruals, announced guidance forecasts, conference call tone, and managers' private discretionary trades in the post-announcement trading window. We call the organizing concept the Timely Disclosure Hypothesis, i.e., reflecting the notion that managers release through available channels all of their private post-quarter information at announcement. Our first and most important test of this null examines the predictability of post-announcement returns using *PQS*. If managers disclose all of their private information as measured by *PQS*, we should observe none. Second, Timely Disclosure implies that *PQS* is positively related to the announcement return over and above the effects of within-quarter information, including *WQS*.

The alternative to Timely Disclosure is the Leaning Against the Wind (LAW) Hypothesis. With this alternative, managers use discretionary channels to understate the private information contained in *PQS*. That is, managers do not fully disclose their private signal, withholding some of the surprise for the future, and even bias their disclosures downward at announcements. They thereby induce opposite-sign predictable components in announcement and post-announcement returns. Thus, under the LAW alternative, we should find that *PQS* is correlated negatively with the announcement returns, controlling for *WQS* and other controls and correlated positively with post-announcement returns. In testing the LAW alternative, we also examine whether managers' tendency to bias their disclosures is symmetric.[2] We examine whether managers understate both good news (i.e., bias disclosures negatively for positive information) and bad news (i.e., bias disclosures positively for negative information) and whether they do so symmetrically.

We also look to the drivers of these results by examining the attributes of the announcements themselves. That is, if returns are reliably related to private information, the same pattern of implied disclosure distortion should be evident both indirectly in stock returns and directly in the channels of discretionary disclosure themselves. We consider three disclosure channels: discretionary accruals, guidance (in this case, managers' bundled forecasts), and conference call tone, measured through natural language processing algorithms. If we reject Timely Disclosure in favor of the LAW alternative, these should each, all else equal, be negatively related to *PQS*. If we find a positive correlation between the measures of disclosures and *PQS*, we cannot reject the Timely Disclosure null.

Our results in terms of point estimates and statistical power, however, favor the LAW alternative. Looking at stock returns themselves, we find that *PQS* strongly positively predicts post-announcement returns. This same conclusion holds using excess announcement returns, which, after the imposition of appropriate controls (e.g., *WQS*,

[1] Many anecdotes exist that sophisticated investors have tried to achieve an informational edge by analyzing unique data to predict firms' fundamental activities. For example, a UBS analyst was reported to have purchased satellite images of Walmart parking lots to estimate business activity ahead of the release of quarterly earnings (Ozik and Sadka, 2013).

[2] The literature has some evidence of a related effect, by which managers appear to behave asymmetrically when they fail Timely Disclosure. They withhold bad news and fully announce good news. See Kothari, Shu, and Wysocki (2008) and Roychowdhury and Sletten (2012).

earnings surprise, etc.), are negatively correlated with *PQS*. Thus, the basic stock return data show that managers understate their post-quarter private information. However, our results on announcement returns show that Leaning Against the Wind behavior of managers is asymmetric. The relation between announcement returns and *PQS* is strongly negative when *PQS* is positive, while no statically significant relation exists between announcement returns and negative *PQS*. This suggests that while managers understate good news, they do not understate bad news.

We also look at the three direct measures of discretionary disclosure. We consider whether they provide evidence that, independent of that from stock return data, managers do not fully disclose and instead lean against the wind of their private signals.

First, we examine discretionary accruals. The LAW alternative predicts that discretionary accruals appear suppressed when *PQS* is high, i.e., a negative correlation. Our empirical tests do not show a strong relation between discretionary accruals and *PQS*. Therefore, we cannot reject Timely Disclosure in favor of the LAW alternative based on accruals.

Second, we ask whether management forecasts or guidance issued around earnings announcement dates (often called bundled forecasts) reject Timely Disclosure, and, if so, whether they do so in favor of LAW. The evidence here is similar but considerably stronger. That is, the issuance of pessimistic bundled forecasts is systematically related to *PQS*. The probability of realized future earnings (or revenue) exceeding bundled forecasts is positively and significantly associated with *PQS*. As the LAW alternative would predict, managers issue more pessimistic forecasts (in this case, guidance) in the presence of more positive post-quarter sales information.

Third, we examine managerial tone in announcement conference calls. We generate sentiment scores measuring managerial tone from managers' speech using conference call transcripts. Managerial tone is a function of the ratio of the number of positive words relative to the sum of the number of positive and negative words [the list of positive and negative words is from Loughran and McDonald (2011)]. Just as with discretionary accruals and bundled forecasts, we test sentiment scores against *PQS*. As above, we find that call sentiment is significantly and negatively related to *PQS*. In addition, consistent with managers' asymmetric LAW incentives, the negative relation is concentrated in the subsample of positive *PQS*. This holds with and without controls alike.

The conclusions we derive about managerial behavior from *PQS* are the same whether we look to announcement and post-announcement returns or whether we look to direct channels of managerial discretion (discretionary accruals, guidance, and conference call tone) offered at announcement. With the exception of discretionary accruals, the remaining data sources point toward rejection of Timely Disclosure in favor of the LAW alternative.

The next logical question is: Why would managers, consistently across channels, choose to understate or communicate the opposite of their private information, leading the information withheld to leak out only slowly, post-announcement? Clearly, if managers at announcement obscure fundamental information for a quarter, they enjoy a transitory informational asymmetry versus analysts and the market. This improves their post-announcement trade opportunities. Managers could in principal also induce asymmetries by magnifying, i.e., overstating, their private signals instead of reversing them. However, managers' observed preference to lean against the wind is sensible in the presence of insider trading opportunities. That is, managers could wish to increase the predictable portion of their company's stock price by understating the private information they have about post-quarter sales. On the contrary, overstating can be a risky choice for managers because it induces possible litigation risk. In any case, we find no evidence consistent with managers' overstating the magnitude of their private signals.

Further, managers' tendency to lean against the wind, while always at least somewhat present, is asymmetric. We find that understatement is much stronger when managers possess positive private information. This asymmetry is credible if understating bad news prior to insider sales leads to higher litigation risks (Skinner, 1994, 1997).

Is our rejection of Timely Disclosure consistent with insiders' trades after earnings announcements? While relatively few such insider trades are in our sample, we find that the negative relation between *PQS* and announcement return is stronger when insiders subsequently purchase their firms' shares. We also show that the positive predictability of *PQS* for post-announcement returns is even stronger in the presence of subsequent insider purchases. Our results show that this relation is driven by instances when *PQS* is positive. We do not observe any statistical relation of *PQS* with announcement returns and post-announcement returns, when *PQS* is negative and insiders subsequently sell. This results is consistent with managers' asymmetric LAW incentives for personal trading purposes.

The rest of this paper is organized as follow. In the next section, we review related literature. Section 3 describes our methodology and real-time sales indexes. Section 4 demonstrates the predictability of *WQS* for fundamentals as well as announcement returns. In Section 5, we study returns around earnings announcement dates and the information contained in *PQS*. In Section 6, we examine the mechanisms through which managers can manipulate the market's expectation as well as their post-announcement trades. In Section 7, we provide our concluding remarks.

2. Related literature

Our paper adds to the literature on managers' asymmetric incentives to disclose good news versus bad news. In general, the literature has shown that bad news tends to be delayed and good news tends to be accelerated. For example, Kothari, Shu, and Wysocki (2008) show that managers delay the release of bad news up to a certain threshold, but they release good news immediately. Roychowdhury and Sletten (2012) discuss the earnings reporting process as a mechanism that forces managers to disclose bad news that they otherwise have incentives to withhold. Graham, Harvey, and Rajgopal (2005) find that some chief financial officers claim that they delay

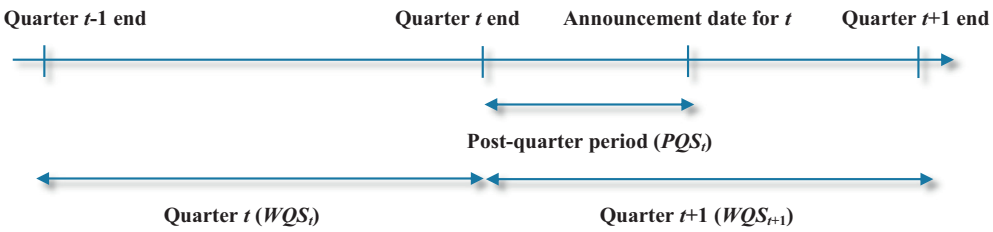

Fig. 1. Time periods around earnings announcements and real-time corporate sales. The figure plots the time line around quarterly earnings announcements and describes the time periods for which real-time corporate sales indexes are measured. *WQS* is within-quarter measure of the index, and *PQS* is the measure for the post-quarter period. The post-quarter period is defined as the time period beginning the fiscal quarter $t+1$ and ending prior to the announcement date for quarter t earnings.

bad news disclosures in the hope that the firm's status improves. However, opposing incentives exist to release bad news early. For example, Skinner (1994, 1997) and Baginski, Hassell, and Kimbrough (2002) show that litigation risk can motivate managers to quickly reveal bad news. Contrary to the discussion on bad news disclosure, only a few papers study managerial incentives to delay the disclosure of good news. Yermack (1997) [see also Aboody and Kasznik (2000)] shows that chief executive officers receive option awards shortly before favorable news, implying a delay of good news. Our paper contributes to the literature showing that managers' departures from the Timely Disclosure Hypothesis can be sensitive to post-quarter private information held by managers at announcement and that managers can act through their stock trading to benefit from these departures.

This paper also touches on the literature on insider trading. Rogers (2008) shows that managers provide high-quality disclosures before selling shares and low-quality disclosures prior to purchasing them. Piotroski and Roulstone (2005) show that insider trades are positively related to firms' future earnings performance and inversely related to recent returns, indicating that insiders possess superior information and that this information is most valuable when the market has it wrong. Jenter (2005) finds that top managers act to express contrarian views on firm value. Roychowdhury and Sletten (2012) provide evidence that managers delay the disclosure of bad news when they are net sellers. Our findings are generally consistent with these views but further show that insiders could manage the market's impression through their announcements in ways that make their private information at announcement more valuable to their personal trading.

Finally, this paper is related to a growing literature that uses textual analysis to understand financial markets (Tetlock, 2007; Tetlock, Saar-Tsechansky, and Macskassy, 2008; Loughran and McDonald, 2011). Mayew and Venkatachalam (2012) use vocal emotion analysis software to show that managerial vocal cues contain useful information on firms' fundamentals. Chen De, Hu, and Hwang (2014) study Seeking Alpha, a popular financial blog, and find that positive sentiment predicts earnings announcements and future stock returns. Druz, Petzev, Wagner, and Zeckhauser (2016) show that conference call tone predicts future earnings and uncertainty. Bartov, Faurel, and Mohanram (2015) use the Tweeter feed to extract aggregate sentiment before earnings announcements. Our paper studies the textual tone of managerial conference calls to test whether it conforms to the Timely Disclosure Hypothesis.

3. Methodology and the main variable

In this section, we describe the main variables of the empirical tests and explain how we construct them.

3.1. Real-time corporate sales indexes

We construct our real-time indexes of corporate sales, *WQS* and *PQS*, to mimic firms' sales systems, using proprietary outside data sources. Fig. 1 helps to explain how we construct our main variables to examine the relation between managerial private information and reported earnings. The figure plots the time line around the earnings announcement date for quarter t. The post-quarter period is defined as being between the beginning of the fiscal quarter $t+1$ and the announcement date of quarter t earnings. We denote within-quarter sales information for fiscal quarter t as WQS_t and the sales information for the post-quarter period as PQS_t.

We obtain measures of real-time consumer activity from MKT Mediastats, LLC. The data are collected from various sources, including consumer devices. For example, a data set is collected from approximately 350 million mobile phones (about 95%) and tablets (about 5%) worldwide, of which approximately 50 million devices are US-based. Another source provides data from a few million US-based desktops. Although data points for US firms can be obtained from non-US devices, we include data points obtained only from US-based devices. The data cover large big-box retailers whose main revenue source is their physical retail stores and does not include e-commerce businesses or other types of retailers, such as telecommunication companies or restaurants. Consequently, the sample consists of 50 US retail firms.

Table 1 reports the firms in the sample, their ticker symbols, and their US-based revenues as of 2014. Twenty-nine sample firms are included in the National Retail Federation (NRF) list of the top one hundred US retailers. NRF data include private firms, online retailers, restaurants, and telecommunication companies, as well as big-box retailers. The total revenue of sample firms in 2014 is \$1.2 trillion, with average (median) firm-level revenue of \$24.4 billion (\$7.3 billion). The total revenue of our sample firms is about 64% of the total revenue of the NRF Top 100 Retailers. The ratio jumps to 77% when

Table 1
Sample firms.
This table reports the firms in the sample, their tickers, headquarter locations, and US sales amounts as of 2014. US sales amounts are obtained from the National Retail Federation and Yahoo! Finance.

Ticker	Name	Headquarters	US retail sales (Millions of US dollars)
AEO	American Eagle Outfitters Inc.	Pittsburgh, PA	3283
ANF	Abercrombie & Fitch Co.	New Albany, OH	3744
ANN	Ann Inc.	New York, NY	2533
ASNA	Ascena Retail Group Inc.	Suffern, NY	4713
BBBY	Bed Bath & Beyond Inc.	Union, NJ	11,708
BBY	Best Buy Co., Inc.	Richfield, MN	35,957
BIG	Big Lots Inc.	Columbus, OH	5177
CASY	Casey's General Stores Inc.	Ankeny, IA	7767
CHS	Chico's FAS Inc.	Fort Myers, FL	2675
COST	Costco Wholesale Corporation	Issaquah, WA	79,694
CVS	CVS Health Corporation	Woonsocket, RI	67,974
DDS	Dillard's Inc.	Little Rock, AR	6490
DKS	Dick's Sporting Goods Inc.	Coraopolis, PA	6811
DLTR	Dollar Tree Inc.	Chesapeake, VA	8390
DSW	DSW Inc.	Columbus, OH	2496
EXPR	Express Inc.	Columbus, OH	2165
FDO	Family Dollar Stores Inc.	Matthews, NC	10,489
GES	Guess Inc.	Los Angeles, CA	2418
GNC	GNC Holdings Inc.	Pittsburgh, PA	2613
GPS	The Gap Inc.	San Francisco, CA	13,071
HD	The Home Depot Inc.	Atlanta, GA	74,203
HTSI	Harris Teeter Supermarkets Inc.	Matthews, NC	4710
JCP	J. C. Penney Company Inc.	Plano, TX	12,184
JOSB	Joseph A. Bank Clothiers Inc.	Hampstead, MD	3253
JWN	Nordstrom Inc.	Seattle, WA	13,259
KORS	Michael Kors Holdings Limited	London, UK	4371
KR	The Kroger Co.	Cincinnati, OH	103,033
KSS	Kohl's Corp.	Menomonee Falls, WI	19,023
LL	Lumber Liquidators Holdings, Inc.	Toano, VA	1047
LB	L Brands	Columbus, OH	10,303
M	Macy's, Inc.	Cincinnati, OH	28,027
MW	The Men's Wearhouse Inc.	Houston, TX	3253
PIR	Pier 1 Imports Inc.	Fort Worth, TX	1866
RAD	Rite Aid Corporation	Camp Hill, PA	26,528
RH	Restoration Hardware Holdings Inc.	Corte Madera, CA	1867
ROST	Ross Stores Inc.	Pleasanton, CA	11,032
SHLD	Sears Holdings Corporation	Hoffman Estates, IL	25,763
SIG	Signet Jewelers Limited	Hamilton, Bermuda	5736
SKS	Saks Inc.	New York City, NY	3148
SVU	SUPERVALU Inc.	Eden Prairie, MN	11,499
SWY	Safeway Inc.	Pleasanton, CA	36,330
TFM	The Fresh Market Inc.	Greensboro, NC	1753
TGT	Target Corp.	Minneapolis, MN	72,618
TIF	Tiffany & Co.	New York, NY	4250
TJX	The TJX Companies Inc.	Framingham, MA	22,206
URBN	Urban Outfitters Inc.	Philadelphia, PA	3323
WBA	Walgreens Boots Alliance Inc.	Deerfield, IL	72,671
WFM	Whole Foods Market Inc.	Austin, TX	13,642
WMT	Wal-Mart Stores Inc.	Bentonville, AR	343,624
WSM	Williams-Sonoma Inc.	San Francisco, CA	4591
□ Total			1219,282
□ Average			24,386
□ Median			7289

we exclude non-pure retailers, such as restaurants and telecommunications, from the list.

Each data source contains billions of individual activities, such as web searches and downloads, by users. For example, the data set obtained from the cell phones and tablets contains annually more than three billion user activities, of which about four hundred million activities are generated in the US. We search for specific types of events among various activities. We focus on an individual event: a consumer's intention to visit or shop at a particular retail store. We identify approximately one million of such individual events for our sample firms per year from multiple sources. These events are counted and aggregated per retailer each week. For example, a search for driving directions to a Walmart store is counted toward Walmart's consumer activity for the week. Other examples of such events are queries concerning store location or coupon downloads.

Some retailers have multiple brand-name stores. For example, GAP has Gap, Banana Republic, Old Navy, Piperlime,

Athleta, and INTERMIX. Therefore, consumer activities for the firm include all the possible combinations of search terms with all the brand names of the firms. Total events for GAP aggregates activities across all of its brand-name stores.

Our real-time sales indexes (*WQS* and *PQS*) are derived using weekly consumer activity data, aggregated to the firm level. *WQS* for a given quarter and firm uses that firm's quarterly growth rate of events over the previous four quarters, taking log differences between the number of events aggregated over the given quarter and the average of the prior four quarters.

PQS is measured in a similar fashion. We aggregate individual events during the post-quarter period and express in full-quarter units by multiplying the number of aggregated events by the number of weeks in the quarter and dividing it by the number of weeks in the post-quarter period. *PQS* is then analogous to, and in the same units as, *WQS*, i.e., the log difference of the estimated number of events for the quarter and the quarterly average of the number of events aggregated over the previous four quarters.

Fig. 2 illustrates one of the data sources on consumer activities that are used to construct our sales indexes. Panels A and B provide daily time series of individual events pertaining to GAP and Target Corporation over the period of December 2012 to November 2013. Panel C shows the time series of events for a larger sample derived from data extracted from Android mobile devices in the United States. The data are normalized by scaling to the highest value of daily activities during the sample. The figure displays observed patterns that are clearly correlated with consumption. For example, all three panels share a similar pattern, displaying higher levels of activity during holiday seasons and spikes in volume during weekends. The midyear spike in GAP coincides with its midyear sale event.

3.2. Variable definitions and summary statistics

We obtain stock market variables, including stock returns, prices, and number of shares outstanding for the firms in our sample, from the Center for Research in Security Prices. The Institutional Brokers' Estimate System detail history file has analyst forecasts and earnings announcement dates. Financial statements are from Compustat.

Table 2 presents summary statistics of the main variables. Quarterly revenue growth is calculated as $S_{i,t}/S_{i,t-1} - 1$, where $S_{i,t}$ is quarterly revenue in fiscal quarter t for firm i. To estimate standardized unexpected revenue (*SUR*), we assume that revenue follows a seasonal random walk with a drift. *SUR* for stock i in quarter t is defined as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}]/\sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. Standardized unexpected earnings (*SUE*) is estimated as $(AE_{i,t} - FE_{i,t})/P_{i,t}$, where $AE_{i,t}$ is quarterly earnings per share (EPS) announced for stock i in quarter t, $FE_{i,t}$ is the mean of analysts' forecasted EPS, and $P_{i,t}$ is quarter-end price. The announcement return is calculated as the return in excess of the market during the period beginning one day before the earnings announcement date and ending three days after the announcement date. The post-earnings-announcement return (*PAR*) is the return of each firm in excess of the market for the period beginning four days after the announcement date and ending 60 days after the announcement date.

Panel A reports descriptive statistics of the main variables. *WQS* has a slightly higher average, median, and standard deviation compared with revenue growth. *WQS* has a mean (median) of 0.034 (0.024) and a standard deviation of 0.316. Revenue growth has a mean (median) of 0.027 (0.015) and a standard deviation of 0.209. Announcement returns for this sample are positive on average, with a mean of 0.7% and a median of 0.3%. The average *PAR* is also slightly positive at 0.2%, but the median has a negative value of −0.2%.

Panel B reports Pearson correlations (upper right) and Spearman rank correlations (lower left). *WQS* has significant and positive correlations with revenue growth, *SUR*, *SUE*, and the announcement return. The correlation between *WQS* and *PAR* is significantly positive at the 10% and 1% level using Pearson and Spearman, respectively. As expected, revenue growth and *SUR* have significantly positive correlations with *SUE* and announcement returns and positive correlations with *PAR*, implying that revenue growth and surprises are important sources for *SUE* and announcement returns, as well as for post-earnings-announcement returns.

4. Prediction using real-time sales indexes

In this section, we examine the informativeness of real-time corporate sales indexes with respect to firm fundamentals.

4.1. Sales and earnings

Table 3 demonstrates the predictive power of our corporate sales indexes for revenue growth and surprises. Panel A reports regressions of quarterly revenue growth on quarterly growth of consumer activities, as defined in Section 3. Panel A uses quarterly growth of consumer activities as an independent variable, instead of *WQS*, to map with the time horizon of the dependent variable, which is current-period revenue growth. Thus, the purpose of the analysis in Panel A is to test whether consumer activity data used to calculate *WQS* is informative for predicting firm revenue.

Models 1–4 show the results of pooled time series cross-sectional regressions. For Models 2, 3, and 4, we include time (year-quarter) fixed effects, firm fixed effects, and both time and firm fixed effects, respectively. Model 5 shows Fama-MacBeth regression results. For each quarter, we estimate cross-sectional regressions of revenue growth on the quarterly growth rate of consumer activities. Then, we calculate the time series average of the regression coefficients and measure its naïve time series t-value. For Models 1–4, we report the adjusted R^2. The average R^2 is reported for Model 5. The sample consists of firm-quarters of US retailers with fiscal quarters ending between March 2009 and July 2014.

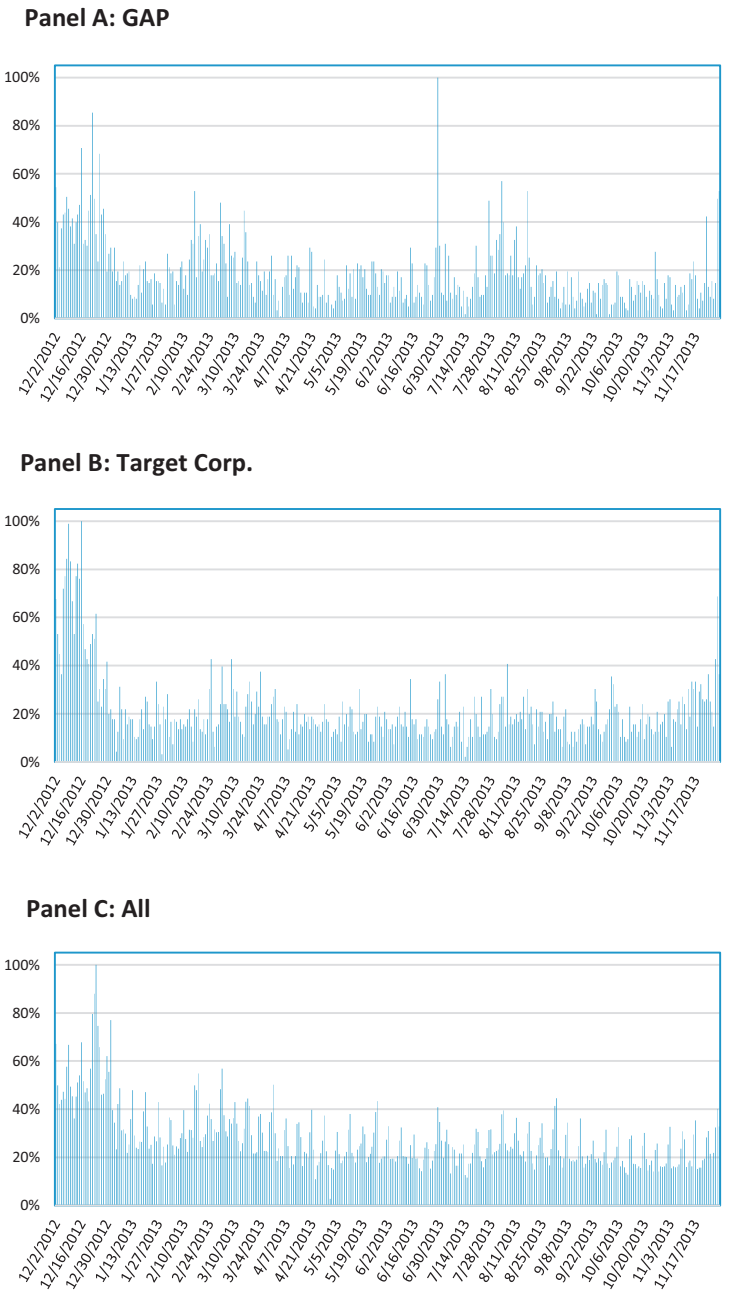

Fig. 2. Daily time series of consumer activities obtained from Android device. The figure plots one of the data sources used to construct the real-time corporate sales index. Panels A and B provide daily time series of consumer activities to GAP and Target Corp. over the period December 2012 to November 2013. Panel C describes the consumer activities to all the firms in the sample. The *y*-axis plots daily consumer activities, scaled by the highest value of daily activities during the time period. The highest value is set to 100%. The data are extracted from Andoid mobile devices in the United States.

Panel A shows that revenue growth is strongly predicted by our consumer sales activity indexes. Model 1 shows an R^2 of 39%. The coefficient is 0.4 (t-value of 24); that is, a 1% increase in consumer activity is associated with a 0.4% increase in revenue. The results are robust to firm and time fixed effects and to the Fama-MacBeth specification in Model 5. While the magnitude of the average coefficient in Model 5 is lower at 0.29, the naïve t-value is still strongly significant at 8.62 and the average R^2 is 23%. Our indexes undoubtedly include noise, but they clearly are strongly correlated with actual revenues and thus can serve as effective proxies.

Fig. 3 shows the results of Table 3 graphically. The figure scatter-plots revenue growth on the growth of consumer activities. The vertical axis is the quarterly revenue growth, and the horizontal axis is the consumer activity growth. The red line is the predicted value of revenue growth using consumer activities. As in Table 3, the slope of the fitted line is less than one, so that not all of our measured traffic to stores leads to actual con-

Table 2
Summary statistics.

Panel A shows the descriptive statistics of the main variables, and Panel B reports correlations. The upper right corner of Panel B reports Pearson correlations and the lower left corner provides Spearman correlations. Within-quarter sales (*WQS*) is the real-time corporate sales measured for fiscal quarter *t*. The quarterly revenue growth for firm *i* as of fiscal quarter *t* is calculated as $S_{i,t}/S_{i,t-1}$ minus one, where $S_{i,t}$ is the quarterly revenue as of fiscal quarter *t* for firm *i*. Standardized unexpected revenue (*SUR*) for stock *i* in quarter *t* is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}] / \sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. Standardized unexpected earnings (*SUE*) is estimated as $(AE_{i,t} - FE_{i,t}) / P_{i,t}$, where $AE_{i,t}$ is quarterly earnings per share announced for quarter *t* of stock *i*, $FE_{i,t}$ is mean analysts' forecasted earnings per share, and $P_{i,t}$ is quarter-end price. The announcement return is calculated as the return in excess over the market during the period of one day before the earnings announcement date and three days after the announcement date. The post-earnings announcement return (*PAR*) is the return of each firm in excess over the market for the period beginning on four days after the announcement dates for fiscal quarter *t* earnings and ending 60 days after the announcement dates. *p*-values of correlations are reported in square brackets.

	WQS	Revenue growth	*SUR*	*SUE*	Announcement Return	*PAR*
Panel A: Descriptive statistics						
N	918	894	890	869	918	914
Mean	0.0336	0.0271	0.0194	0.0011	0.0066	0.0018
Standard deviation	0.3164	0.2091	1.6619	0.0073	0.0887	0.1290
25th percentile	−0.0960	−0.0723	−0.8717	0.0000	−0.0409	−0.0762
Median	0.0237	0.0148	0.0950	0.0005	0.0028	−0.0017
75th percentile	0.1675	0.1174	0.9837	0.0016	0.0519	0.0678
Panel B: Correlations						
WQS		0.628	0.140	0.082	0.127	0.064
		[0.000]	[0.000]	[0.013]	[0.000]	[0.054]
Revenue growth	0.627		0.232	0.086	0.164	0.051
	[0.000]		[0.000]	[0.010]	[0.000]	[0.131]
SUR	0.137	0.205		0.069	0.175	0.067
	[0.000]	[0.000]		[0.039]	[0.000]	[0.046]
SUE	0.065	0.099	0.235		0.059	0.111
	[0.048]	[0.003]	[0.000]		[0.076]	[0.001]
Announcement return	0.154	0.164	0.126	0.261		0.066
	[0.000]	[0.000]	[0.000]	[0.000]		[0.046]
PAR	0.091	0.046	0.051	0.054	0.035	
	[0.006]	[0.173]	[0.126]	[0.103]	[0.286]	

Table 3
Revenue growth, standardized unexpected revenue (SUR), and real-time corporate sales index.

Panel A shows the regressions of the quarterly revenue growth on the quarterly growth of consumer activities. The quarterly revenue growth for firm *i* as of fiscal quarter *t* is calculated as $S_{i,t} / S_{i,t-1}$ minus one, where $S_{i,t}$ is the quarterly revenue as of fiscal quarter *t* for firm *i*. The quarterly growth of consumer activities is calculated as the log difference between aggregated consumer activities during fiscal quarter *t* and those during fiscal quarter *t*−1. Panel B reports the results of regressions of the standardized unexpected revenue (*SUR*) on within-quarter sales (*WQS*). *SUR* for stock *i* in quarter *t* is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}]/\sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. *WQS* is real-time corporate sales index for fiscal quarter *t*, defined as quarterly growth rate of consumer events over the previous four quarters, taking log differences between the number of events aggregated over quarter *t* and the average of the prior four quarters. Models 1–4 show the results of pooled regressions, and Model 5 shows the result of Fama-MacBeth regressions. Adjusted R^2 (for pooled regressions) and the average R^2 (for Fama-MacBeth regressions) are reported. The sample includes firm-quarters of US retailers with fiscal quarter ending between March 2009 and July 2014.

	Model 1	Model 2	Model 3	Model 4	Model 5
Panel A: Quarterly revenue growth on quarterly growth of consumer activities					
Coefficient	0.414	0.307	0.417	0.310	0.290
t-value	[24.11]	[15.12]	[23.67]	[14.74]	[8.62]
Adj. (average) R^2	39.38%	47.03%	37.07%	44.98%	23.33%
Fixed effects	N/A	Time	Firm	Firm and time	Fama-MacBeth
Panel B: SUR on WQS					
Coefficient	1.155	0.800	1.128	0.706	0.795
t-value	[5.33]	[3.43]	[5.06]	[2.92]	[2.24]
Adj. (average) R^2	2.98%	18.93%	4.11%	21.07%	3.78%
Fixed effects	N/A	Time	Firm	Firm and time	Fama-MacBeth

sumption. However, the scatter plot reaffirms a strong correlation.

In Panel B of Table 3, we study revenue surprises using *WQS* as the explanatory variable. We report results when *SUR* is projected onto *WQS*, using the same specifications as in Panel A. The results show that *WQS* has strong predictability for revenue surprises, robust to firm and time fixed effects. For example, including both time and firm fixed effects (Model 4) yields a coefficient of 0.7 on *WQS* with a *t*-value of 2.92. The Fama-MacBeth specification provides similar results, implying that the predictability of *WQS* is unlikely due to specific time periods or unobserved firm characteristics.

Next, we examine the relation between earnings and *WQS*. Table 4 shows that *WQS* predicts earnings, not simply revenue surprises. Model 1 shows the result of a simple regression of *SUE* on *WQS*. The coefficient is positive, with a *t*-value of 2.37. Model 2 uses revenue surprises to predict earnings surprises. Jagadeesh and Livnat (2006) show that revenue surprises help explain earnings announcement

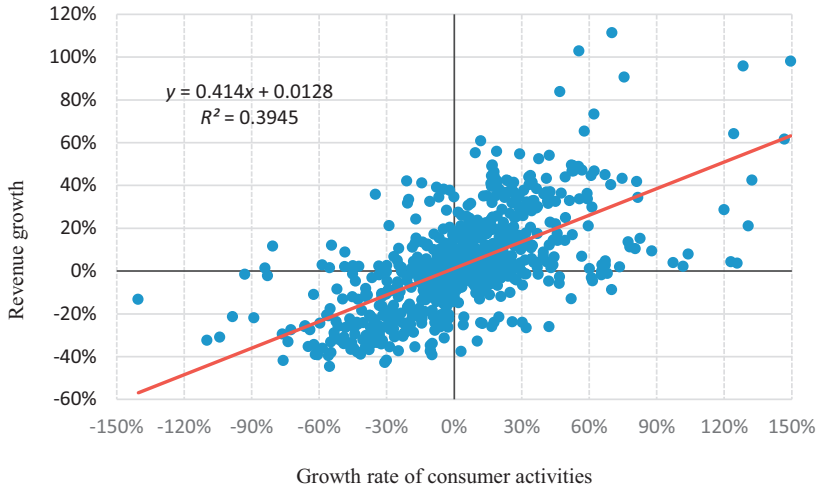

Fig. 3. Revenue growth versus consumer activity growth. The figure scatter plots revenue growth on the growth rate of consumer activities. The vertical axis is revenue growth, and the horizontal axis is the growth rate of consumer activities. The red line is the predicted value of revenue growth. The sample includes US retail firms of fiscal quarter ending between March 2009 and July 2014. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article).

Table 4
Regression of standardized unexpected earnings (SUE) on within-quarter sales (WQS).

This table reports the regression results of standardized unexpected earnings on the within-quarter real-time corporate sales index. *SUE* is estimated as $(AE_{i,t} - FE_{i,t}) / P_{i,t}$, where $AE_{i,t}$ is quarterly earnings per share announced for quarter t of stock i, $FE_{i,t}$ is mean analysts' forecasted EPS, and $P_{i,t}$ is quarter-end price. Firm quarters with stock prices below \$5 are excluded. Standardized unexpected revenue (*SUR*) for stock i in quarter t is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}] / \sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. Adjusted R^2 (for pooled regressions) and the average R^2 (for Fama-MacBeth regressions) are reported. The sample includes firm-quarters of US retailers with fiscal quarter ending between March 2009 and July 2014.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WQS × 100	0.167		0.148	0.158	0.201	0.180	0.172	0.070
	[2.37]		[2.08]	[2.14]	[2.42]	[2.18]	[2.00]	[1.12]
SUR × 100		0.026	0.021	0.021		0.037	0.043	0.031
		[2.32]	[1.80]	[1.74]		[2.91]	[3.18]	[3.15]
Lagged *SUE*				−0.013			−0.046	0.346
				[−0.60]			[−2.13]	[2.46]
Adj. (average) R^2	0.53%	0.49%	0.79%	0.75%	11.07%	11.90%	12.38%	33.72%
Fixed effects	N/A	N/A	N/A	N/A	Time and firm	Time and firm	Time and firm	Fama-MacBeth

return and post-announcement drift. Ertimur, Livnat, and Martikainen (2003) study different sources of earnings surprises and find that investors value revenue surprises more highly than expense surprises. Consistent with these studies, we find that *SUR* is highly correlated with *SUE*, implying that *SUR* is an important source of earnings surprises.

Model 3 includes both *WQS* and *SUR* on the right-hand side. Although the magnitude of both *SUR* and *WQS* becomes slightly smaller than previous specifications, both variables remain statistically significant. Model 4 controls for lagged *SUE* to address its persistence (see, e.g., Bernard and Thomas, 1989, 1990; Arbarnell and Bernard, 1992). But, lagged *SUE* turns out to be insignificant and its inclusion does not affect the significance of *WQS* and *SUR*.

Models 5–8 examine whether time-specific effects or firm-specific heterogeneity drive the results. We add time and firm fixed effects or use the Fama-MacBeth method. With the exception of the Fama-MacBeth specification, which yields a positive but insignificant *WQS* coefficient, the ability of *WQS* to predict earnings surprises is robust. For example, Model 7, which projects *SUE* onto *WQS*, *SUR*, and time and firm fixed effects, yields a coefficient of 0.172 and a *t*-value of 2. Overall, Table 4 demonstrates that *WQS* reliably predicts earnings surprises.

4.2. Return predictability

Now we turn our attention to announcement returns. Table 5 examines the *WQS* predictions of earnings announcement returns. We use a five-day event window around the announcement, beginning one day prior and ending three days later. Berkman and Troung (2009) show that the proportion of Russell 3000 firms making after-hours earnings announcements is over 40%. Based on our dating of events, earnings-related price changes for after-hour announcements are observed on day 1, not day 0. In addition, forecasts for the following quarter are usually announced within one trading day. We thus use a slightly longer event window to capture the market's complete reaction to the announcement.[3]

Panel A shows the average announcement returns, in excess of the market, during the event window by *WQS*

[3] Choosing different event windows does not alter the inference.

Table 5
Returns around earnings announcement dates.

Panel A shows the average returns during the event window by quintiles of within-quarter real-time corporate sales index (*WQS*). The event window is the period between one day prior to the earnings announcement date and three days afterward. Returns are calculated in excess of the market returns of the corresponding periods. Quintiles of *WQS* are calculated using the following process. In month *t*, we pool firms that have fiscal quarter ending during the three-month rolling period of $t-2$ to t and rank the firms based on *WQS* to obtain quintile cutoff values. Then, we use the quintile cutoff values to assign quintile ranks for the firms that have fiscal quarter ending in month *t*. The last row of Panel A reports the results of the hypothesis testing for the mean difference between the highest and the lowest quintiles. Panel B reports the regressions of event returns on *WQS*. Models 1–4 show the results of pooled regressions, and Model 5 shows the results of Fama-MacBeth regressions. Adjusted R^2 (for pooled regressions) and the average R^2 (for Fama-MacBeth regressions) are reported. The sample includes firm-quarters of US retailers with fiscal quarter ending between March 2009 and July 2014.

Panel A: Announcement returns by WQS quintile

Quintile	*N*	Mean	Standard deviation	Median	*t*-value
Low (short)	161	−1.26%	9.53%	−1.32%	−1.68
2	184	−0.04%	8.51%	−0.21%	−0.06
3	188	0.49%	8.51%	0.90%	0.80
4	205	1.67%	8.82%	0.82%	2.72
High (long)	180	2.14%	8.76%	1.81%	3.27
Hypothesis test: High – low	341	3.40%	9.13%		3.43

Panel B: Regressions of announcement returns on WQS

	Model 1	Model 2	Model 3	Model 4	Model 5
Coefficient	0.035	0.035	0.033	0.032	0.033
t-value	[3.86]	[3.79]	[2.85]	[2.75]	[2.35]
Adj. (average) R^2	1.49%	2.76%	3.02%	4.34%	4.22%
Fixed effects	N/A	Firm	Time	Firm and time	Fama-MacBeth

quintiles. We form *WQS* quintiles as follows. At each month-end *t*, we rank all sample firms based on their *WQS*, calculated for their most recent fiscal quarter, to obtain quintile cutoff values. We use these values to assign quintile ranks for the firms whose fiscal quarter ends at month-end *t*. We follow this process to make sure that we use the full sample of firms when ranking them. Different methods of assigning quintile scores—for example, in each month *t*, ranking firms using only firms that have fiscal quarter-end at *t*—do not change our results.

Panel A shows that *WQS* reliably predicts announcement returns. Average announcement returns are monotonic across quintiles of *WQS*. The average return for firms in the lowest quintile is −1.26% (with 10% significance), and the average returns of Quintiles 4 and 5 are 1.67% and 2.14%, respectively (both at 1% significance). The last column reports tests of the null hypothesis that the mean difference between the highest and lowest quintiles is zero. This difference is economically significant at 3.40% (five-day holding period) and highly statistically significant (a *t*-value of 3.43).

In Panel B, we run regressions of announcement returns on *WQS*. Models 1–4 show the results of pooled regressions, and Model 5 uses Fama-MacBeth regressions. The results here agree with those in Panel A, showing that *WQS* reliably predicts announcement returns. This conclusion is robust to time, firm, and time and firm fixed effects as well as to a Fama-MacBeth specification. For example, in Model 1, the coefficient on *WQS* is 0.035, with a *t*-value of 3.86. The *WQS* coefficient magnitudes are very similar across all model specifications, at around 0.035. In terms of economic size, these coefficients imply that a one standard deviation increase in *WQS* predicts an additional 1.1% increase in announcement return.

The informativeness of *WQS* for announcement excess returns is also apparent in Fig. 4. The figure plots the average buy-and-hold returns for ten days on either side of the announcement date. Panel A and Panel B report average excess returns for the lowest and highest quintiles, respectively. The return profiles across event windows differ markedly. As expected, a statistically significant negative (positive) jump is evident around the announcement date for the lowest (highest) quintile.

5. Private information and corporate disclosure

Having demonstrated that *WQS* contains important information on firm fundamentals, earnings surprises, and announcement returns, we feel justified then, in turn, to interpret the post-quarter equivalent to *WQS*—*PQS*—as a proxy for managers' private information at announcement and to explore its effects on disclosure.

5.1. Post-earnings-announcement returns and private information

Our Timely Disclosure Hypothesis implies that managers release their post-quarter private information at announcement through discretionary channels, so that post-announcement prices incorporate this information. If managers inform market participants of their private information at announcement dates, then post-announcement returns should not be predictable by *PQS*.

Table 6 begins by reporting regressions of post-announcement returns on *PQS*, *WQS*, and various controls. We estimate the model

$$PAR_{i,t} = \alpha + \beta_1 PQS_{i,t} + \beta_2 WQS_{i,t} + \gamma' \boldsymbol{X}_{i,t} + \varepsilon_{i,t}, \qquad (1)$$

where $PAR_{i,t}$ is the post-announcement excess return for firm *i* and quarter *t*, beginning on the fourth day and ending on the 60th day after the announcement date of fiscal quarter *t* earnings. $\boldsymbol{X}_{i,t}$ represents the controls, including *SUE*, *SUR*, *Size* (log market capitalization), *BE*/*ME* (log

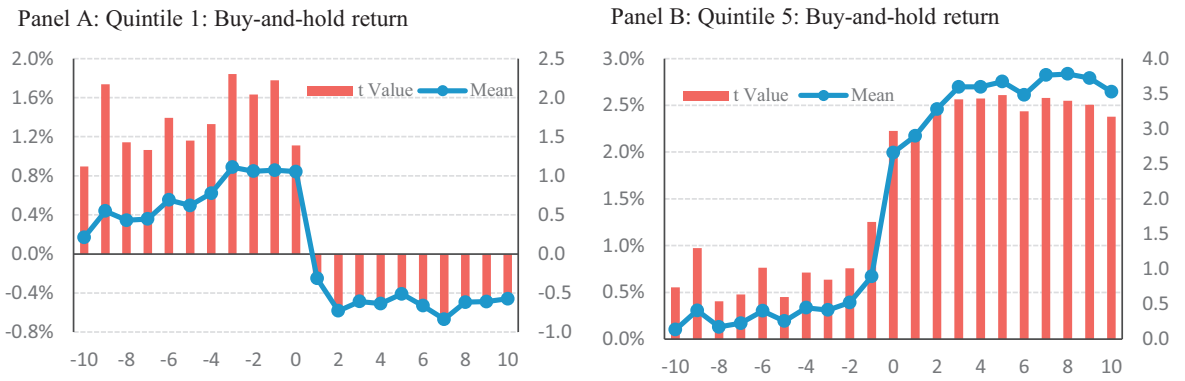

Fig. 4. Excess returns around earnings announcement dates. This figure plots the average buy-and-hold returns during the event window from ten days prior to the earnings announcement date (day 0) to ten days afterward. Returns are calculated in excess of the market returns of corresponding periods. Panel A shows the average buy-and-hold return of firms in Quintile 1 of *WQS*, Panel B shows the results of firms in Quintile 5. The sample includes US retail firms of fiscal quarter ending between March 2009 and July 2014.

Table 6
Post-earning-announcement returns and real-time corporate sales.

This table reports the regression results of the post-earnings-announcement returns on post-quarter sales (*PQS*), within-quarter sales (*WQS*), and other control variables. The dependent variables are the return of each firm in excess over the market for the period beginning four days after the quarter t earnings announcement dates and ending 60 days after the announcement dates. *PQS* is obtained from the real-time corporate sales index for the period beginning after the fiscal quarter t end and ending prior to the announcement date for quarter t earnings and used as a proxy for managements' private information on the fiscal quarter t+1. *P.PQS* equals *PQS* when *PQS* is positive and zero otherwise. *N.PQS* equals *PQS* when *PQS* is negative and zero otherwise. *SUE* is estimated as $(AE_{i,t} - FE_{i,t}) / P_{i,t}$, where $AE_{i,t}$ is quarterly earnings per share (EPS) announced for quarter t of stock i, $FE_{i,t}$ is mean analysts' forecasted EPS, and $P_{i,t}$ is quarter-end price. Standard unexpected revenue (SUR) for stock i in quarter t is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}] / \sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. *Size* is the natural logarithm of the market capitalization as of fiscal quarter t end. *BE/ME* is the natural logarithm of the book-to-market ratio as of the most recent fiscal year ending at least three months prior to fiscal quarter t end. *PastReturn* is the cumulative return in excess over the market from 30 to three days prior to the earnings announcement. The sample includes firm-quarters of US retailers with fiscal quarter ending between March 2009 and July 2014.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
PQS	0.037		0.033	0.037	0.045	0.053			
	[2.33]		[1.77]	[1.94]	[2.20]	[2.57]			
P.PQS							0.041	0.045	0.060
							[1.44]	[1.48]	[1.87]
N.PQS							0.031	0.045	0.045
							[1.02]	[1.44]	[1.37]
WQS		0.030	0.011	0.006	−0.019	−0.033	0.005	−0.019	−0.031
		[1.75]	[0.50]	[0.25]	[−0.68]	[−1.18]	[0.21]	[−0.68]	[−1.13]
SUE				1.526	1.530	−0.042	1.543	1.530	−0.040
				[1.73]	[1.72]	[−0.05]	[1.74]	[1.71]	[−0.04]
Lagged *SUE*				−0.726	−0.543	−0.721	−0.723	−0.542	−0.718
				[−1.30]	[−0.96]	[−1.28]	[−1.29]	[−0.96]	[−1.28]
SUR				0.005	0.002	0.002	0.005	0.002	0.002
				[1.49]	[0.49]	[0.57]	[1.49]	[0.49]	[0.56]
Lagged *SUR*				[−0.01]	−0.005	[−0.00]	−0.006	−0.005	−0.004
				[−2.00]	[−1.36]	[−1.17]	[−2.00]	[−1.36]	[−1.17]
Size	−0.007	−0.005	−0.007	[−0.01]	−0.005	−0.094	−0.007	−0.005	−0.094
	[−1.83]	[−1.45]	[−1.83]	[−1.74]	[−1.27]	[−5.83]	[−1.70]	[−1.26]	[−5.83]
BE/ME	0.017	0.015	0.017	0.015	0.014	0.012	0.015	0.014	0.012
	[2.54]	[2.35]	[2.56]	[2.07]	[1.74]	[0.90]	[2.04]	[1.74]	[0.91]
PastReturn	−0.025	−0.030	−0.027	−0.044	−0.020	−0.090	−0.044	−0.020	−0.090
	[−0.50]	[−0.61]	[−0.52]	[−0.83]	[−0.36]	[−1.65]	[−0.82]	[−0.36]	[−1.65]
Adj. R^2	1.75%	0.98%	1.66%	2.50%	7.85%	13.08%	2.38%	7.72%	12.94%
Fixed effects	N/A	N/A	N/A	N/A	Time	Time and firm	N/A	Time	Time and firm

book-to-market ratios for the most recent fiscal year ending at least three months prior to fiscal quarter t end), and *PastReturn* (cumulative excess return from 30 to three days prior to the announcement date).

Model 1 shows that *PQS* explains a positive and significant fraction of post-announcement return. Model 2 includes *WQS* individually and reports that it also is positive and significant at the 10% level. However, Model 3 reveals that *WQS* is subsumed by *PQS*, which remains statistically significant at the 10% level. Thus, managers' private information during quarter t+1 is not fully observed by investors at announcement. At least some information is disseminated and reflected more slowly over time in stock prices.

Models 4–6 add controls of *SUE* and *SUR*, their lags, and the fixed effects. Bernard and Thomas (1990) and Jagadeesh and Livnat (2006), for example, show that *SUE* and *SUR* predict post-announcement returns. As expected, both *SUE* and *SUR* have positive coefficients although they are often insignificant. More important for our purposes, Models 4–6 show that the predictability of *PQS* for post-announcement returns is robust.

Next we partition the sample based on the sign of *PQS* to investigate the potential for asymmetric disclosures by managers. We define *P.PQS* (*N.PQS*) as equal to *PQS* when *PQS* is positive (negative) and zero otherwise. *P.PQS* and *N.PQS* thus are proxies, respectively, for positive and negative post-quarter private information.

Models 7–9 show the results of regressions using *P.PQS* and *N.PQS*. The coefficients of both *P.PQS* and *N.PQS* are positive, indicating that, regardless of sign, managers do not fully disclose their information regarding *PQS* at announcement. However, Model 9, which includes both time and firm fixed effects, shows that the predictability of post-announcement returns is stronger for positive *PQS*. The coefficient of *P.PQS* is significant at the 10% level and of higher magnitude than that of *N.PQS*, which is statistically insignificant. In Section 6, we report that this positive relation of post-announcement returns with positive *PQS* is particularly strong when insider purchases take place post-announcement (see Panel B of Table 11). This could imply that delayed disclosures of positive information are at least partly due to personal trading motivations.

In general, the results in Table 6 show that, regardless of sign, higher *PQS* predicts higher post-announcement returns, suggesting that managers disclose only part of their private information at announcement and leave the rest to be diffused into the price over time. These results provide an interesting perspective relative to previous studies that discuss asymmetric incentives of managers to disclose good news versus bad news. Some studies show that managers withhold bad news while releasing good news quickly (e.g., Kothari, Shu, and Wysocki, 2008; Roychowdhury and Sletten, 2012). Others examine managerial incentives to delay good news for personal benefits, such as stock option awards (e.g., Yermack, 1997; Aboody and Kasznik, 2000). Our results suggest that managers generally withhold a portion of their private post-quarter information, perhaps a bit more so when the information is positive.

5.2. Announcement returns and private information

To further investigate such apparent withholding of information, we study whether managers provide biased disclosure at announcement by examining the relation between announcement returns and *PQS*. We report in Table 7 regressions of announcement returns on *PQS, WQS*, and controls.

For the controls' coefficients, consistent with the literature, *Size* tends to exert a significantly negative effect. *BE*/*ME* has a positive effect, but this is rendered insignificant once *SUE* and *SUR* are controlled. *PastReturn* has a negative effect, albeit often insignificant, indicating that announcement returns typically incorporate at least some reversal of past returns (So and Wang, 2014). As expected, *SUE* and *SUR* both are positively and significantly related to announcement returns, whereas lagged *SUE* and lagged *SUR* have negative but insignificant coefficients. Overall, our sample shares similar control characteristics with those reported in other studies.

As in Table 5, *WQS* positively predicts announcement returns before and after controls. But, to our surprise, *PQS* enters with a significantly negative coefficient, suggesting that post-quarter real-time information not only is understated but also appears in opposite sign. That is, when the post-quarter is positive (negative), the announcement return is unexpectedly low (high), after controls that include *WQS*.

Is this negative relation between announcement return and *PQS* symmetric with respect to good versus bad underlying signals? The results from Models 6 to 10 suggest that *P.PQS* is the overwhelming driver of this overall negative relation. The coefficient on *N.PQS* is also negative, but it is much smaller and statistically insignificant. Disclosure distortions are therefore asymmetric. While a tendency exists to temper both good and bad news, good news is tempered heavily; bad news, only slightly and insignificantly.

This negative correlation of announcement returns with positive *PQS* has several interpretations. One would be litigation risk. Skinner (1994, 1997), for example, suggests that litigation risks discourage optimistic projections by managers. Distorting downward positive information can help avoid lawsuits. However, managers can also be exposed to litigation risk if they overstate their private information when negative, pushing stock prices temporarily higher. That is, litigation risk is not entirely consistent with our results because it is more likely to be symmetric with respect to disclosure distortions.

Another possible interpretation is that managers may distort positive disclosures downward to reduce their firm's current stock price and thereby increase its expected return. This bestows upon managers private advantages if, for example, they can use the post-announcement window to trade their company's stock. We examine the insider trading rationale further in Section 6.

In sum, Table 7 shows the negative relation between *PQS* and announcement returns, especially when *PQS* is positive. This result, together with the predictability of *PQS* for post-announcement returns, suggests that managers may intentionally understate their expectation for the next quarter at the time of earnings announcements. Thus, the expected stock return increases as managers' private information is gradually released and reflected in stock prices. This opens up opportunities for managers to take advantage for their personal gain.

6. Accruals, bundled forecasts, managerial tones, and insider trading

The established patterns in returns around announcement dates and *PQS* suggest that managers use announcement disclosures to influence the market's views in particular ways. In this section, we look at direct evidence of disclosure distortions to examine if they match those suggested by our indirect tests based on stock prices.

Table 7
Announcement returns and real-time corporate sales.

This table reports the regression results of announcement returns on post-quarter sales (*PQS*), within-quarter sales (*WQS*), and other control variables. The dependent variable is the returns around announcement dates for fiscal quarter t earnings. The announcement return is calculated as the return in excess over the market during the period of one day before the earnings announcement date and three days after the announcement date. *PQS* is obtained from the real-time corporate sales index for the period beginning after the fiscal quarter t end and ending prior to the announcement date for quarter t earnings and used as a proxy for managements' private information on the fiscal quarter t+1. *P.PQS* equals *PQS* when *PQS* is positive and zero otherwise. *N.PQS* equals *PQS* when *PQS* is negative and zero otherwise. Standardized unexpected earnings (*SUE*) is estimated as $(AE_{i,t} - FE_{i,t}) / P_{i,t}$, where $AE_{i,t}$ is quarterly earnings per share (EPS) announced for quarter t of stock i, $FE_{i,t}$ is mean analysts' forecasted EPS, and $P_{i,t}$ is quarter-end price. Standardized unexpected revenue (*SUR*) for stock i in quarter t is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}] / \sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. *Size* is the natural logarithm of the market capitalization as of fiscal quarter t end. *BE/ME* is the natural logarithm of the book-to-market ratio as of the most recent fiscal year ending at least three months prior to fiscal quarter t end. *PastReturn* is the cumulative return in excess over the market from 30 to three days prior to the earnings announcement. The sample includes firm-quarters of US retailers with fiscal quarter ending between March 2009 and July 2014.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
PQS	−0.041	−0.041	−0.041	−0.027	−0.021					
	[−3.41]	[−3.35]	[−3.62]	[−2.15]	[−1.63]					
P.PQS						−0.063	−0.065	−0.054	−0.035	−0.034
						[−3.42]	[−3.46]	[−3.11]	[−1.85]	[−1.71]
N.PQS						−0.017	−0.015	−0.028	−0.019	−0.009
						[−0.87]	[−0.75]	[−1.50]	[−0.99]	[−0.45]
WQS	0.073	0.078	0.055	0.046	0.048	0.076	0.081	0.058	0.047	0.052
	[5.16]	[5.23]	[3.96]	[2.74]	[2.77]	[5.42]	[5.47]	[4.18]	[2.79]	[2.98]
SUE			5.494	5.314	5.455			5.440	5.288	5.436
			[10.32]	[9.68]	[9.24]			[10.19]	[9.59]	[9.20]
Lagged *SUE*		−0.612	−0.578	−0.530	−0.233		−0.620	−0.583	−0.534	−0.234
		[−1.67]	[−1.71]	[−1.52]	[−0.66]		[−1.69]	[−1.72]	[−1.53]	[−0.66]
SUR			[0.01]	0.009	[0.01]			0.007	0.009	0.008
			[3.58]	[3.91]	[3.49]			[3.63]	[3.91]	[3.48]
Lagged *SUR*		0.000	[−0.00]	−0.002	[−0.00]		0.000	−0.002	−0.002	−0.002
		[0.12]	[−1.21]	[−0.70]	[−0.93]		[0.15]	[−1.22]	[−0.72]	[−0.95]
Size	−0.008	[−0.01]	[−0.01]	−0.005	−0.034	−0.008	−0.008	−0.006	−0.005	−0.034
	[−3.19]	[−2.94]	[−2.22]	[−1.90]	[−3.36]	[−3.35]	[−3.12]	[−2.33]	[−1.96]	[−3.35]
BE/ME	0.009	[0.01]	[0.00]	0.007	0.008	0.009	0.012	0.003	0.007	0.008
	[2.05]	[2.39]	[0.49]	[1.39]	[0.99]	[2.17]	[2.52]	[0.58]	[1.43]	[1.01]
PastReturn	−0.028	[−0.04]	[−0.04]	−0.050	−0.071	−0.028	−0.038	−0.043	−0.050	−0.070
	[−0.84]	[−1.10]	[−1.36]	[−1.49]	[−2.06]	[−0.84]	[−1.10]	[−1.35]	[−1.49]	[−2.05]
Adj. R^2	4.99%	5.16%	19.41%	20.33%	21.74%	5.16%	5.38%	19.40%	20.25%	21.81%
Fixed effects	N/A	N/A	N/A	Time	Time and firm	N/A	N/A	N/A	Time	Time and firm

We examine three channels that managers could use to affect disclosures: discretionary accruals, management forecasts or guidance, and nuanced tone in conference calls. We also examine how managers' private information, measured using *PQS*, affects managers' incentives for personal trading.

6.1. Discretionary accruals

Demski (1998), Subramanyam (1996), and Louis and Robinson (2005) suggest that managers use discretionary accruals to communicate their private information and show that discretionary accruals are positively associated with future profitability or dividend changes. In our context, we seek to determine if managers use distortions in discretionary accruals to lower the market's expectation of future earnings.

Each quarter, discretionary accruals (*DA*) are estimated using an extended Jones (1991) model from a cross-sectional regression (Larcker and Richardson, 2004)

$$TA = \alpha_0 + \alpha_1(1/A) + \alpha_2(\Delta REV - \Delta REC) + \alpha_3 PPE + BE/ME + CFO + \varepsilon, \quad (2)$$

where *TA* is total accruals scaled by lagged total assets; *A* is total assets; *PPE* is current-quarter gross property, plant, and equipment scaled by prior-quarter total assets; ΔREV is the quarterly change in revenue scaled by prior-quarter total assets; ΔREC is the quarterly change in net receivables scaled by prior-quarter total assets; *BE/ME* is the book-to-market ratio; and *CFO* is current-quarter operating cash flow scaled by prior-quarter total assets.[4] Fiscal quarter dummies are also included in the regression. Discretionary accruals are the residuals from Eq. (2), ε.

If managers distort discretionary accruals, a negative relation should be evident between discretionary accruals and *PQS*. We run the following regression to test this prediction:

$$DA = \alpha + \beta_1 WQS + \beta_2 PQS + \beta_3 SUE + \beta_4 SUR + \eta. \quad (3)$$

Panel A of Table 8 reports the results of Eq. (3) across related specifications. Model 1 suggests that *WQS* is not significantly related to discretionary accruals. This is

[4] We follow Larcker and Richardson (2004), who extend the modified Jones model by adding the book-to-market ratio and cash flow from operation. Dechow, Sloan, and Sweeney (1995) show that the modified Jones model exhibits the most power in detecting earnings management. However, McNichols (2002) highlights the importance of operating cash flow in accrual estimation. We also measure accruals from the statement of cash flow instead of the balance sheet, following Hribar and Collins (2001).

Table 8
Regressions of discretionary accruals.

This table examines managers' private information and discretionary accruals. Each quarter, discretionary accruals are estimated from the modified Jones model that includes book-to-market ratio and cash flow from operation (Larcker and Richardson, 2004), using a cross-sectional regression. *Meet* is a dummy variable that takes a value of one if a firm has earnings that were within plus or minus half-a-cent of the consensus forecast and zero otherwise. *Beat* is a dummy variable that takes a value of one if a firm has reported earnings between half-a-cent and one-and-a-half cents above the consensus forecast and zero otherwise. *Miss* is a dummy variable that takes a value of one if a firm has reported earnings between half-a-cent and one-and-a-half cents below the consensus forecast and zero otherwise. Post-quarter sales (*PQS*) is obtained from the real-time corporate sales index for the period beginning after the fiscal quarter t end and ending prior to the announcement date for quarter t earnings and used as a proxy for managements' private information on the revenue of the fiscal quarter t+1. Standardized unexpected earnings (*SUE*) is estimated as $(AE_{i,t} - FE_{i,t}) / P_{i,t}$, where $AE_{i,t}$ is quarterly earnings per share (EPS) announced for quarter t of stock i, $FE_{i,t}$ is mean analysts' forecasted EPS, and $P_{i,t}$ is quarter-end price. Standardized unexpected revenue (*SUR*) for stock i in quarter t is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}] / \sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. The sample includes firm-quarters of US retailers with fiscal quarter ending between March 2009 and July 2014.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Panel A: Regressions on PQS							
PQS		0.000	−0.001	−0.001	−0.001	−0.002	−0.002
		[−0.02]	[−0.61]	[−0.61]	[−0.62]	[−0.64]	[−0.59]
WQS	0.002		0.003	0.002	0.002	0.004	0.006
	[0.93]		[1.20]	[0.61]	[0.59]	[1.09]	[1.74]
SUE				0.314	0.307	0.331	0.338
				[3.24]	[3.16]	[3.23]	[3.13]
Lagged *SUE*					−0.065		
					[−1.05]		
SUR				0.000	0.000	0.001	0.000
				[1.18]	[1.21]	[1.45]	[−0.43]
Lagged *SUR*					0.000		
					[0.01]		
Adj. R^2	−0.15%	−0.02%	−0.08%	1.62%	1.49%	0.22%	14.41%
Fixed effects	N/A	N/A	N/A	N/A	N/A	Time	Time and Firm
Panel B: Regressions on the Beat, Meet, and Miss dummies							
PQS	−0.002	−0.001	0.000	−0.001	−0.001	−0.001	−0.001
	[−0.87]	[−0.60]	[−0.19]	[−0.42]	[−0.43]	[−0.48]	[−0.47]
WQS	0.003	0.003	0.003	0.003	0.001	0.003	0.006
	[1.06]	[1.21]	[1.24]	[1.12]	[0.50]	[0.86]	[1.65]
Beat	0.003			0.003	0.003	0.004	0.002
	[1.96]			[1.82]	[1.98]	[2.14]	[1.13]
Meet		0.001		0.001	0.001	0.001	−0.001
		[0.38]		[0.44]	[0.49]	[0.59]	[−0.32]
Miss			−0.005	−0.004	−0.004	−0.004	−0.006
			[−1.81]	[−1.61]	[−1.51]	[−1.64]	[−2.29]
Beat × *PQS*	0.008			0.007	0.007	0.008	0.005
	[1.27]			[1.08]	[1.11]	[1.19]	[0.81]
Meet × *PQS*		−0.001		−0.001	0.000	0.000	0.002
		[−0.10]		[−0.12]	[−0.01]	[−0.02]	[0.28]
Miss × *PQS*			−0.017	−0.016	−0.016	−0.014	−0.011
			[−1.74]	[−1.65]	[−1.69]	[−1.39]	[−1.14]
SUE					0.315	0.338	0.334
					[3.24]	[3.31]	[3.09]
SUR					0.000	0.001	0.000
					[1.22]	[1.43]	[−0.32]
Adj. R^2	0.42%	−0.35%	0.84%	0.92%	2.73%	1.45%	15.21%
Fixed effects	N/A	N/A	N/A	N/A	N/A	Time	Time and firm

sensible, because *WQS* is strongly correlated with revenue growth and earnings growth, which are already accounted for when discretionary accruals are estimated. Model 2 regresses *DA* on *PQS*, which enters the model with an insignificant coefficient. Insignificance of *PQS* is observed across specifications, suggesting that managers do not use discretionary accruals as a channel for distorting *PQS*.[5]

The only variable that produces a significant coefficient is *SUE*, suggesting that the relation between discretionary accruals and earnings surprises is positive. This result is not unexpected, as firms with strong *SUE* tend to have strong growth expectations and strong receivables and other elements of working capital. Thus, growth expectation can be an unobserved variable that is not driven out by including *PQS*.

Studies on earnings management have shown that firms have strong incentives to manage earnings to meet and beat a benchmark, such as analysts' earnings forecasts or previous year's reported earnings (Burgstahler and Dichev, 1997; Bartov, Givoly, and Hayn, 2002; Bhojraj, Hribar, Picconi, and McInnis, 2009; Roychowdhury, 2006). Therefore, in Panel B, we introduce dummy variables that indicate whether firms are on the verge of beating or missing analysts' forecasts, and we examine whether managers' incentives for earnings management through discretionary

[5] We also use specifications with partitioned *PQS*, by including positive *PQS* and negative *PQS* separately. Because the variables of signed *PQS* are also insignificant, those results are not reported.

accruals are affected by the likelihood of beating or missing analysts' forecasts.

We follow Bhojraj, Hribar, Picconi, and McInnis (2009) to define three dummy variables; *Meet, Beat*, and *Miss. Meet* equals one if a firm has earnings that were within plus or minus half-a-cent of the consensus forecast and zero otherwise. *Beat* equals one if a firm has reported earnings between half-a-cent and one-and-a-half cents above the consensus forecast and zero otherwise. *Miss* equals one if a firm has reported earnings between half-a-cent and one-and-a-half cents below the consensus forecast and zero otherwise. We include interaction terms of these dummy variables with *PQS* as well in Eq. (3).

Panel B shows that *Beat* is positive and significant, suggesting that firms may use discretionary accruals more aggressively when they are on the verge of beating the benchmark. The coefficients on *Miss* are negative and significant, suggesting that firms that are unable to beat the benchmark have reduced discretionary accruals.

The more interesting variables are the interaction terms of the dummies with *PQS*. If managers use discretionary accruals to manage down the market's expectation, negative coefficients would be expected on the interaction terms. However, we do not find much evidence on whether firms that marginally beat or miss the benchmark use earnings management, upon seeing strong *PQS*. Overall, *PQS* is not strongly related to discretionary accruals. Therefore, they are not the main source of the dual relation between *PQS* and announcement and post-announcement returns.

6.2. Bundled forecasts

To explore potential distortions in earnings and revenue forecasts provided by management, we create a sample of management forecasts issued concurrently with earnings announcements (i.e., bundled forecasts) and investigate the relation between these forecasts and *PQS*.[6] If managers issue pessimistically biased forecasts when *PQS* is strong, the likelihood that ex post realized earnings exceed management forecasts should be positively related to *PQS*. We test this prediction using a Probit model.

The dependent variable of our model is a dummy variable equal to one if the management forecast is pessimistic compared with realized earnings (or revenue) and zero otherwise. We assume the management forecast to be pessimistic if the related management forecast error is less than a cutoff value. The management forecasting error for EPS is defined as $(MF_{i,t+1} - A_{i,t+1})$ scaled by $P_{i,t+1}$, where $MF_{i,t+1}$ is the management forecast for quarter $t+1$, and $A_{i,t+1}$ is realized quarterly EPS amount. The forecasting error for revenue is defined as $(MF_{i,t+1} - A_{i,t+1})$ scaled by $MF_{i,t+1}$. We use the cutoff value of -0.002 for earnings (10 cents for a stock of \$50) and -0.1% for revenue.[7]

Table 9 reports the results of the Probit regressions. Panel A uses management forecasts of EPS to calculate the dependent variable, and Panel B uses the revenue forecasts of managements. We report the average marginal probability change for a one standard deviation change in the values of the covariates.

The results show that the likelihood of ex post earnings or revenue being higher than management forecasts is positively and significantly related to *PQS*. A one standard deviation increase in *PQS* is associated with about 5–8% (7–8%) increase in the probability of management forecasts at the time of announcements being ex post pessimistic relative to realized earnings (revenue).

We also partition the sample based on signs of *PQS*, by including *P.PQS* and *N.PQS* separately. Although the likelihood of firms' realized EPS being higher than their own guidance does not vary much based on the sign of *PQS*, Panel B shows that the likelihood of realized revenue beating the guidance is significantly higher when *PQS* is positive. These results are consistent with previous tests, showing that managers distort guidance downward when *PQS* is positive.

In sum, Table 9 provides direct evidence of downward managerial disclosure distortions at announcement when *PQS* is positive. This direct evidence is consistent with our results about disclosure distortion by observing stock price changes.

6.3. Managerial tone of conference calls

Lastly, we turn to conference call tone and whether it shows similar signs of disclosure distortion. The dependent variable is now *TONE*, defined as the log of (1+ number of positive words) / (1+ number of positive words + number of negative words). We follow Loughran and McDonald (2011) for the classification of positive and negative words.

Table 10 reports the results of *TONE* regressed on *PQS* and control variables. Model 1 shows *TONE* to be positively related to *WQS* and negatively related to *PQS*. However, once we control for *SUE* and *SUR, PQS* remains significant while *WQS* is subsumed. This is consistent with earlier findings, i.e., managers' tone (in addition to announcement return and guidance forecasts) is negatively correlated with *PQS*.

Models 6–10 again partition *PQS* by sign. The results suggest that the negative correlation between *TONE* and *PQS* is mostly due to *P.PQS*. Managers therefore distort negatively their tone in possession of good *PQS* information but only slightly positively when *PQS* is weak.

Overall, the analyses in Tables 9 and 10 provide evidence that direct disclosures (over which managers have control) mimic the indirect results observed in stock prices (which managers cannot necessarily control). This strengthens the view that stock price movements are not simply about the market's reaction, independent of the direct signals that managers seem to be sending. The evidence from bundled forecasts and conference call tone

[6] Approximately 32% of earnings announcements in our sample are bundled with managements' forecast of the next quarter. This ratio is consistent with Rogers and Van Buskirk (2013), who find that about 29% of announcements are bundled for the post-Regulation Fair Disclosure period.

[7] Both threshold values are approximately at the 40 percentile of their respective distributions. This number is roughly consistent with Rogers and Van Buskirk (2013), who classify roughly 35% of announcements as negative surprises. Using different threshold values does not change the inference.

Table 9
Bundled management forecasts.

This table investigates the relation between managements' forecasts issued around earnings announcement dates and their private information. The dependent variable is a dummy variable equal to one if the management forecast is pessimistic compared with realized earnings (or realized revenue) and zero otherwise. We assume that management forecasts are pessimistic if the related management forecast errors are less than a cutoff value. The management forecasting error is defined as ($MF_{i,t+1} - A_{i,t+1}$) divided by $P_{i,t+1}$ (or $MF_{i,t+1}$), where $MF_{i,t+1}$ is the management forecast for quarterly earnings per share (EPS) (or quarterly revenue) and $A_{i,t+1}$ is realized quarterly EPS (or quarterly revenue). The management forecasting error is normalized by $P_{i,t+1}$ for EPS forecast and by $MF_{i,t+1}$ for revenue forecast. Panel A analyzes management forecasts for EPS, while Panel B uses revenue forecasts of managements. Post-quarter sales (*PQS*) is obtained from the real-time corporate sales index for the period beginning after the fiscal quarter t end and ending prior to the announcement date for quarter t earnings and used as a proxy for managements' private information on the fiscal quarter t+1. *P.PQS* equals *PQS* when *PQS* is positive and zero otherwise. *N.PQS* equals *PQS* when *PQS* is negative and zero otherwise. Standardized unexpected earnings (*SUE*) is estimated as ($AE_{i,t} - FE_{i,t}$) / $P_{i,t}$, where $AE_{i,t}$ is quarterly EPS announced for quarter t of stock i, $FE_{i,t}$ is mean analysts' forecasted EPS, and $P_{i,t}$ is quarter-end price. Standardized unexpected revenue (*SUR*) for stock i in quarter t is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}] / \sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of ($S_{i,t} - S_{i,t-4}$) over the preceding eight quarters. Panel B uses analysts' forecast errors for revenue, *AFE*, as an explanatory variable. *AFE* is computed as ($AR_{i,t} - FR_{i,t}$) / $FR_{i,t}$, where $AR_{i,t}$ is quarterly sales amount announced for quarter t of stock i, and $FR_{i,t}$ is mean analysts' forecast for quarterly sales. *Size* is the natural logarithm of the market capitalization as of fiscal quarter t end. *BE*/*ME* is the natural logarithm of the book-to-market ratio as of the most recent fiscal year ending at least three months prior to fiscal quarter t end. We report the marginal probability change that is obtained by multiplying the average marginal effect of individual observations with a one-standard deviation change in the values of the covariates. Pseudo R^2 based on McFadden's method are reported. The sample consists of the firm-quarters of companies that provided management forecasts on or within three days after the earnings announcement dates.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Variable	Coefficient	Marginal Probability	Coefficient	Marginal Probability	Coefficient	Marginal Probability	Coefficient	Marginal Probability	Coefficient	Marginal Probability	Coefficient	Marginal Probability
Panel A: Management forecasts on earnings												
PQS	0.667	6.55%	0.814	7.63%	0.746	6.66%						
	[2.30]		[2.31]		[2.09]							
P.PQS							0.587	3.93%	0.722	4.81%	0.545	3.46%
							[1.36]		[1.50]		[1.11]	
N.PQS							0.789	4.35%	0.867	4.75%	0.961	5.02%
							[1.37]		[1.44]		[1.54]	
SUE ×100	3.329	16.70%	3.306	16.41%	3.010	14.26%	3.340	16.75%	3.297	16.44%	3.003	14.29%
	[5.16]		[5.03]		[4.32]		[5.16]		[5.01]		[4.31]	
SUR			0.077	3.93%	0.095	4.67%			0.074	3.92%	0.092	4.62%
			[1.47]		[1.76]				[1.43]		[1.70]	
WQS			−0.422	−2.66%	−0.398	−2.37%			−0.347	−2.62%	−0.315	−2.27%
			[−0.96]		[−0.89]				[−0.79]		[−0.70]	
Size					−0.223	−9.80%					−0.228	−9.98%
					[−3.20]						[−3.24]	
BE/*ME*					−0.234	−4.40%					−0.232	−4.37%
					[−1.63]						[−1.61]	
Pseudo R^2	8.93%		9.60%		12.75%		8.94%		9.54%		12.75%	
Panel B: Management forecasts on revenue												
PQS	0.998	7.30%	1.127	8.47%	1.050	7.91%						
	[2.08]		[1.97]		[1.80]							
P.PQS							1.349	6.48%	1.339	6.46%	1.386	6.63%
							[1.71]		[1.62]		[1.65]	
N.PQS							0.563	2.30%	0.885	3.62%	0.656	2.66%
							[0.62]		[0.87]		[0.64]	
AFE	22.114	18.25%	20.457	16.94%	20.673	17.00%	22.231	18.31%	20.606	17.02%	20.897	17.10%
	[4.38]		[3.81]		[3.80]		[4.39]		[3.83]		[3.83]	
SUE × 100			0.298	1.62%	0.692	3.76%			0.275	1.52%	0.672	3.69%
			[0.43]		[0.84]				[0.39]		[0.81]	
WQS			−0.132	−1.25%	−0.105	−1.17%			−0.168	−1.11%	−0.145	−0.94%
			[−0.22]		[−0.17]				[−0.27]		[−0.23]	
Size					0.058	2.32%					0.059	2.34%
					[0.56]						[0.56]	
BE/*ME*					−0.213	−4.50%					−0.224	−4.70%
					[−1.24]						[−1.29]	
Pseudo R^2	10.04%		9.74%		10.64%		10.16%		9.80%		10.77%	

thus suggests that managers do use such soft sources of disclosure to intentionally manage down stock prices when post-quarter information is positive.

6.4. Insider trading

We now turn to some evidence around what could incent managers to display the disclosure distortions that we find. Because our results reveal transitory stock price declines at announcement when *PQS* is positive, intentional understatement of positive information can create attractive near-term opportunities for managers to buy stock.

We conjecture that the negative relation between *PQS* and announcement returns is stronger when insiders plan to buy their firms' shares subsequently. We also conjecture that the positive predictions of post-announcement returns by *PQS* are stronger when insiders' purchases take place. Table 11 examines insiders' trades around earnings

Table 10
Managerial tones in conference calls.

This table investigates the relation between the managerial tone in conference call transcripts and their private information. The dependent variable is *TONE*, defined as log (1+ number of positive words) minus log (1+ number of positive words+number of negative words). We use the list of positive and negative words from Loughran and McDonald (2011). Post-quarter sales (*PQS*) is obtained from the real-time corporate sales for the period beginning after the fiscal quarter t end and ending prior to the announcement date for quarter t earnings and used as a proxy for managements' private information on the revenue for the fiscal quarter t+1. *P.PQS* equals *PQS* when *PQS* is positive and zero otherwise. *N.PQS* equals *PQS* when *PQS* is negative and zero otherwise. Standardized unexpected earnings (*SUE*) is estimated as $(AE_{i,t} - FE_{i,t}) / P_{i,t}$, where $AE_{i,t}$ is quarterly earnings per share (EPS) announced for quarter t of stock i, $FE_{i,t}$ is mean analysts' forecasted EPS, and $P_{i,t}$ is quarter-end price. Standardized unexpected revenue (*SUR*) for stock i in quarter t is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}] / \sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. *Size* is the natural logarithm of the market capitalization as of fiscal quarter t end. *BE/ME* is the natural logarithm of the book-to-market ratio as of the most recent fiscal year ending at least three months prior to fiscal quarter t end. *PastReturn* is the cumulative return in excess over the market from 30 to three days prior to the earnings announcement. The sample includes firm-quarters of US retailers with fiscal quarter ending between March 2009 and July 2014.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
PQS	−0.050	−0.053	−0.055	−0.055	−0.042					
	[−1.92]	[−2.05]	[−2.05]	[−2.86]	[−1.98]					
P.PQS						−0.079	−0.056	−0.067	−0.073	−0.062
						[−1.77]	[−1.28]	[−1.47]	[−2.13]	[−1.67]
N.PQS						−0.023	−0.048	−0.043	−0.038	−0.026
						[−0.55]	[−1.19]	[−1.01]	[−1.15]	[−0.77]
WQS	0.072	0.040	0.038	0.028	0.013	0.071	0.038	0.037	0.030	0.017
	[2.22]	[1.20]	[1.08]	[1.16]	[0.45]	[2.20]	[1.15]	[1.05]	[1.22]	[0.58]
SUE		0.180	0.610	0.341	0.666		0.154	0.568	0.285	0.633
		[0.16]	[0.51]	[0.37]	[0.70]		[0.14]	[0.47]	[0.31]	[0.67]
Lagged *SUE*			−1.017	−0.123	0.144			−1.019	−0.140	0.130
			[−1.15]	[−0.18]	[0.21]			[−1.15]	[−0.20]	[0.19]
SUR		0.015	0.013	0.008	0.008		0.015	0.014	0.008	0.008
		[4.38]	[3.39]	[2.47]	[2.39]		[4.42]	[3.43]	[2.51]	[2.40]
Lagged *SUR*			0.005	0.000	−0.005			0.005	0.000	−0.005
			[1.29]	[−0.14]	[−1.37]			[1.30]	[−0.13]	[−1.40]
Accruals			0.105	0.569	0.616			0.098	0.560	0.601
			[0.25]	[1.77]	[1.95]			[0.24]	[1.74]	[1.90]
Size		0.025	0.026	0.048	0.015		0.025	0.026	0.048	0.015
		[5.19]	[5.21]	[2.90]	[0.78]		[5.08]	[5.07]	[2.86]	[0.78]
BE/ME		−0.030	−0.034	0.013	0.028		−0.030	−0.034	0.014	0.028
		[−2.67]	[−2.96]	[0.98]	[1.68]		[−2.65]	[−2.93]	[1.01]	[1.70]
PastReturn		−0.034	−0.053	−0.026	−0.014		−0.034	−0.052	−0.024	−0.010
		[−0.54]	[−0.80]	[−0.50]	[−0.26]		[−0.53]	[−0.78]	[−0.46]	[−0.20]
Adj. R^2	0.75%	10.05%	10.84%	58.18%	61.04%	0.61%	9.85%	10.64%	58.13%	60.99%
Fixed effects	N/A	N/A	N/A	Firm	Time and firm	N/A	N/A	N/A	Firm	Time and firm

announcements. We run the regression

$$R(t,T) = \alpha + \beta_1 PQS + \beta_2 Buy + \beta_3 Sell + \beta_4 Buy \times PQS + \beta_5 Sell \times PQS + \gamma' \boldsymbol{X} + \varepsilon, \quad (4)$$

where $R(t, T)$ is the stock return in excess of the market measured over the period that starts at date t and ends at date T (date 0 is the earnings announcement date), *Buy* (*Sell*) is a dummy equal to one if management team is a net buyer (seller) during the 20 trading day post-announcement period and zero otherwise, and $\boldsymbol{X}$ is a set of controls.

Our sample has significantly more insider sales than purchases. Only 2% of announcements are followed by insider purchases, while approximately 31% of announcements are followed by insider sales. This suggests that insiders typically obtain stocks through stock options and sell those vested stocks due to reasons such as diversification or liquidity.

Panel A uses announcement returns, $R(-1,3)$, as a dependent variable. Negative coefficients on *Buy* and positive coefficients on *Sell* indicate that insiders tend to purchase following a negative announcement and sell subsequent to a positive announcement. These results are consistent with the literature that shows insiders are contrarian (Piotroski and Roulstone, 2005; Jenter, 2005).

For our purposes, we focus on the coefficient on the interaction between *Buy* and *PQS*, which is robust to time and firm fixed effects. It is statistically significant, consistent with our conjecture that the negative relation between *PQS* and announcement returns is stronger when insiders subsequently purchase their firms' shares. However, the mirror image—that managers provide positive disclosures prior to selling in possession of negative information—is not supported by the results. The interaction of *Sell* with *PQS* is insignificant.

In Models 4–6, we further investigate whether asymmetry exists in managers' trading behaviors. We interact *Buy* and *Sell* separately with positive and negative *PQS*. The results show that, once again, the negative relation of *PQS* with announcement returns is driven by instances in which *PQS* is positive and insiders buy. All other interaction terms are insignificant, implying no perceived bias in disclosures when *PQS* is negative or insiders are selling, or both. This result is consistent with the view that insiders talk down temporarily the price of their firm's stock by understating their positive private information at announcement in the hope of purchasing stock thereafter.

Regarding the insignificant interaction term between *Sell* and *PQS*, Rogers (2008) shows that the disclosures of litigation-conscious managers are of higher quality before

selling. Thus, before buying, managers may feel less disciplined by Timely Disclosure. Both the negative coefficient on the interaction term of *P.PQS* with *Buy* and the insignificant coefficient on the interaction of *N.PQS* with *Sell* therefore seem consistent with the extant literature.

Panel B reports the regression results of post-announcement returns over various holding periods. The first two columns use *R*(4,60) as the dependent variable. Neither *Buy* nor *Sell* is strongly related with post-announcement returns. However, consistent with our conjecture, the positive predictability of post-announcement returns by *P.PQS* is particularly strong when insiders' purchases take place. The positive coefficient on the interaction between *P.PQS* and *Buy* (Model 2) shows that the predictability is driven by the cases of positive *PQS*.

The post-announcement price increases could indicate price pressure due to insider purchases, instead of insiders' superior information with respect to *PQS*. Therefore, we divide post-announcement returns into two holding periods: *R*(4,20) and *R*(21,60). *R*(4,20) is contemporaneous return with insider trades, as *Buy* and *Sell* are defined from insider trades during the 20-trading-day period following earnings announcement.

The results show that the positive relation of *PQS* with post-announcement returns when insider purchases take places is not due to price pressures from insiders' trades, reinforcing our conjecture that insiders intentionally

Table 11
Insider trading around earnings announcements.

This table investigates the insiders' trading activities around earnings announcements and the private information. Panel A shows the regression results of the announcement returns on insider trading variables and their interaction terms with post-quarter sales (PQS). Panel B reports the regression results of post-earnings-announcement returns over various holding periods. PQS is obtained from the real-time corporate sales index for the period beginning after the fiscal quarter t end and ending prior to the announcement date for quarter t earnings and used as a proxy for managements' private information on the revenue of the fiscal quarter t+1. *P.PQS* equals *PQS* when *PQS* is positive and zero otherwise. *N.PQS* equals *PQS* when *PQS* is negative and zero otherwise. *Buy* is an indicator variable that equals one if management team is a net buyer during the 20-trading-day period following earnings announcement and zero otherwise. *Sell* is an indicator variable that equals one if management team is a net seller and zero otherwise. Standardized unexpected earnings (*SUE*) is estimated as $(AE_{i,t} - FE_{i,t}) / P_{i,t}$, where $AE_{i,t}$ is quarterly earnings per share (EPS) announced for quarter t of stock i, $FE_{i,t}$ is mean analysts' forecasted EPS, and $P_{i,t}$ is quarter-end price. Standardized unexpected revenue (*SUR*) for stock i in quarter t is calculated as $[(S_{i,t} - S_{i,t-4}) - r_{i,t}] / \sigma_{i,t}$ where $\sigma_{i,t}$ and $r_{i,t}$ are the standard deviation and average, respectively, of $(S_{i,t} - S_{i,t-4})$ over the preceding eight quarters. *DA* is discretionary accrual estimated using the modified Jones model, by estimating a cross-section regression each quarter. *Size* is the natural logarithm of the market capitalization as of fiscal quarter t end. *BE*/*ME* is the natural logarithm of the book-to-market ratio as of the most recent fiscal year ending at least three months prior to fiscal quarter t end. *PastReturn* is the cumulative return in excess over the market from 30 to three days prior to the earnings announcement. Standard errors are clustered at firm level. The sample includes firm-quarters of US retailers with fiscal quarter ending between March 2009 and July 2014.

Panel A: Regressions of announcement returns

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
WQS	0.050	0.047	0.053	0.049	0.045	0.052
	[3.13]	[2.42]	[2.81]	[3.09]	[2.33]	[2.73]
PQS	−0.040	−0.023	−0.020	−0.040	−0.022	−0.019
	[−2.61]	[−1.33]	[−1.16]	[−2.59]	[−1.32]	[−1.13]
Buy	−0.027	−0.032	−0.038	−0.003	−0.004	−0.014
	[−1.23]	[−1.46]	[−1.78]	[−0.09]	[−0.12]	[−0.45]
Sell	0.020	0.020	0.029	0.021	0.019	0.027
	[2.97]	[2.85]	[4.02]	[2.37]	[2.16]	[2.92]
Buy × *PQS*	−0.260	−0.274	−0.242			
	[−2.10]	[−2.19]	[−1.92]			
Sell × *PQS*	0.014	0.003	0.008			
	[0.57]	[0.12]	[0.31]			
Buy × *P.PQS*				−0.453	−0.499	−0.435
				[−1.91]	[−2.10]	[−1.85]
Buy × *N.PQS*				−0.091	−0.074	−0.065
				[−0.42]	[−0.33]	[−0.29]
Sell × *P.PQS*				0.013	0.005	0.016
				[0.35]	[0.14]	[0.43]
Sell × *N.PQS*				0.015	0.000	−0.002
				[0.40]	[0.01]	[−0.06]
DA	0.217	0.212	0.187	0.217	0.210	0.186
	[1.00]	[0.97]	[0.80]	[0.99]	[0.96]	[0.80]
SUE	5.296	5.021	5.380	5.307	5.041	5.370
	[9.64]	[8.80]	[9.02]	[9.65]	[8.82]	[8.99]
SUR	0.005	0.007	0.006	0.005	0.007	0.007
	[2.55]	[3.13]	[2.76]	[2.58]	[3.16]	[2.79]
Size	−0.005	−0.004	−0.045	−0.005	−0.004	−0.045
	[−1.99]	[−1.60]	[−4.20]	[−1.99]	[−1.60]	[−4.25]
BE/*ME*	0.004	0.010	0.005	0.004	0.009	0.005
	[0.87]	[1.75]	[0.56]	[0.83]	[1.70]	[0.56]
PastReturn	−0.044	−0.037	−0.068	−0.044	−0.038	−0.069
	[−1.28]	[−1.05]	[−1.94]	[−1.30]	[−1.07]	[−1.95]
Adj. R^2	20.96%	21.92%	26.78%	20.83%	21.83%	26.64%
Fixed effects	N/A	Time	Time and firm	N/A	Time	Time and firm

(*continued on next page*)

Table 11 (*continued*)

Panel A: Regressions of announcement returns						
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Panel B: Regressions of post-earnings-announcement returns						
	R(4,60)		R(4,20)		R(21,60)	
Variable	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
WQS	−0.020	−0.020	−0.012	−0.012	−0.005	−0.004
	[−0.59]	[−0.60]	[−0.70]	[−0.76]	[−0.19]	[−0.14]
PQS	0.041	0.040	0.007	0.007	0.033	0.032
	[1.37]	[1.38]	[0.56]	[0.58]	[1.07]	[1.06]
Buy	0.012	−0.041	0.029	0.026	−0.022	−0.062
	[0.33]	[−0.66]	[2.22]	[0.98]	[−0.82]	[−1.62]
Sell	−0.010	−0.019	0.002	−0.004	−0.009	−0.011
	[−0.86]	[−1.33]	[0.38]	[−0.55]	[−0.92]	[−0.93]
Buy × *PQS*	0.335		−0.038		0.279	
	[2.28]		[−0.57]		[2.05]	
Sell × *PQS*	0.016		0.024		−0.011	
	[0.49]		[1.72]		[−0.34]	
Buy × *P.PQS*		0.778		−0.006		0.607
		[2.70]		[−0.05]		[3.42]
Buy × *N.PQS*		−0.047		−0.057		−0.012
		[−0.18]		[−0.31]		[−0.07]
Sell × *P.PQS*		0.066		0.052		0.004
		[1.47]		[2.19]		[0.10]
Sell × *N.PQS*		−0.037		−0.007		−0.025
		[−0.78]		[−0.32]		[−0.58]
DA	0.663	0.677	0.379	0.383	0.269	0.275
	[1.37]	[1.38]	[2.04]	[2.05]	[0.61]	[0.61]
SUE	−0.558	−0.585	0.435	0.415	−1.166	−1.169
	[−0.54]	[−0.57]	[0.86]	[0.82]	[−1.21]	[−1.22]
SUR	0.001	0.001	0.002	0.002	−0.001	−0.001
	[0.22]	[0.25]	[1.32]	[1.37]	[−0.22]	[−0.23]
Size	−0.111	−0.111	−0.029	−0.030	−0.076	−0.075
	[−4.78]	[−4.83]	[−3.92]	[−3.87]	[−4.08]	[−4.09]
BE/ME	−0.006	−0.007	−0.002	−0.002	−0.009	−0.009
	[−0.46]	[−0.49]	[−0.29]	[−0.32]	[−0.68]	[−0.70]
PastReturn	−0.100	−0.100	−0.041	−0.041	−0.027	−0.026
	[−1.33]	[−1.34]	[−1.74]	[−1.75]	[−0.39]	[−0.38]
Adj. R^2	16.49%	16.56%	7.89%	7.84%	14.44%	14.32%
Fixed effects	Time and firm	Time and firm	Time and firm	Time and firm	Time and firm	Time and firm

understate their expectation at the announcements upon seeing strong post-quarter-end results. The coefficient on the interaction between (positive) *PQS* and *Buy* is not significant for the contemporaneous return, *R*(4,20), while it is significantly positive for *R*(21,60), suggesting that the price movement is due to slow information release instead of price pressure from insider trades.

Overall, the results in Table 11 are consistent with our conjecture, suggesting that corporate insiders distort downward their discretionary disclosures when they have positive private information and can purchase stock in the post-announcement window.

7. Conclusion

We study the relation between managers' private information and its effects on both discretionary earnings announcement disclosures and insider trading. To do so, we use data sources that are correlated with real-time corporate sales of retail firms. We develop a firm-level real-time corporate sales index for US retail stores and demonstrate its usefulness in explaining future releases of coincident firm fundamentals and future returns. We show that our within-quarter sales index, *WQS*, has strong predictive power for revenue surprises, earnings surprises, and excess earnings announcement returns. The announcement return differential between high- and low-*WQS* firms is 3.40%.

We use *PQS* as a proxy for managers' private information at announcement and study whether their discretionary disclosures of their private information are distorted. We provide evidence against the Timely Disclosure Hypothesis, i.e., managers bias downward their disclosures when they possess positive post-quarter information. We show that managers' forecasts and conference call tone are, according to objective measures, unduly pessimistic when managers have positive post-quarter information. These disclosure distortions are reflected in stock prices. Our *PQS* measure is negatively related to announcement returns, but positively related to post-announcement returns, and is particularly so when *PQS* is positive. These results are stronger in instances in which insiders buy in the post-announcement period, suggesting that managers are driven at least in part by motivations related to personal trading.

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