Media Sentiment, Investor Sentiment, and Stock Price Sensitivity to Earnings

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While prior research has focused on investor sentiment at the market level, we propose and test a measure of firm-specific investor sentiment. Specifically, we focus on the optimism and pessimism embedded in news items about the firm. Using data from Thomson Reuters News Analytics which uses a linguistic analysing engine to rate news items in real-time, we create a firm-specific measure of investor sentiment – i.e., media sentiment – by stripping out the portion of the news rating that is related to firm fundamentals. After controlling for market-wide investor sentiment, we find that when firm-specific media sentiment is positive (negative), investors overreact to positive (negative) earnings surprises. Further, we find that this effect is concentrated in hard to value firms and cannot be explained by information contained in our sentiment measure. Our results suggest that the tone of news items can contribute to the misvaluation of stocks, and this effect is incremental to market-wide investor sentiment.

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1. Introduction

Evidence from studies in behavioral finance suggests that investor sentiment leads to stock mispricing (e.g., Brown and Clift 2005, Baker and Wurgler 2006, Lemmon and Portniaguina 2006). In general, this literature finds investors are overly optimistic (pessimistic) during periods of high (low) investor sentiment, leading to overvaluation (undervaluation) that reverses in the future. More recently, researchers have started to examine the effect of investor sentiment in an accounting context. Brown, Christensen, Elliott, and Mergenthaler (2012) find that firms are more likely to provide and emphasize pro forma earnings when market-wide sentiment is more positive. Hribar and McInnis (2012) find that analysts' forecasts of earnings are more optimistic during periods with positive market-wide sentiment. Bergman and Roychowdhury (2008) find that managers' propensity to provide forecasts is affected by investor sentiment, while Seybert and Yang (2012) find that lower returns around the time that managers provide earnings guidance, consistent with such guidance correcting investors' overestimates of earnings. Mian and Sankaraguruswamy (2012, hereafter MS) provide evidence that market-wide investor sentiment is associated with the stock market's response to unexpected earnings around the earnings announcement date.

One common feature of these studies, as well as the investor sentiment studies in the finance literature, is that they measure investor sentiment at the market level. For example, Bergman and Roychowdhury (2008) and Seybert and Yang (2012) use a market-wide sentiment index based on survey data from the Michigan Consumer Research Center. Brown, Christensen, Elliott, and Mergenthaler (2012), Hribar and McInnis (2012), and MS use a market-wide investor

sentiment measure developed by Baker and Wurgler (2006). However, as Baker and Wurgler (2006) recognize, there will be a firm-specific component to investor sentiment as well.

In this study, we propose a firm-specific measure of investor sentiment and we examine whether the firm-level sentiment affects investors' responses to earnings surprises. Our firm-specific measure is based on the tone of news articles written about the firm in the 30 days preceding the earnings announcement. Our measure is motivated by Tetlock (2007) who finds that media pessimism can affect investors' sentiment about the market, suggesting a psychological link between the news and market prices. Specifically, he finds that pessimism in the 'Abreast of the Market' column in the *Wall Street Journal* leads to downward pressure on stock prices that is not explained by fundamentals. However, he does not consider whether the sentiment in firm-specific news affects the mispricing of individual stocks.

We adopt an approach similar to MS except that we examine media optimism and pessimism in firm-specific news rather than focus on market-wide investor sentiment. They expect market-wide investor sentiment will affect the market's response to good and bad news in different ways. When market-wide investor sentiment is positive, investors will be overly optimistic, causing investors to overact to good earnings news and underreact to bad earnings news. In contrast, when market-wide investor sentiment is negative, investors will be too pessimistic, leading them to overreact to bad earnings news while underreacting to good earnings news. They predict, and find, a positive (negative) relation between market-wide investor sentiment and the earnings response coefficient (ERC) for good (bad) news. We use their framework and examine the effect of firm-specific investor sentiment on the ERC after controlling for market-wide sentiment (as well as the sentiment embedded in the firm's own press releases).

Our study is also motivated by Seybert and Yang (2012) who find that market-wide investor sentiment can lead to overvaluation because investors' firm-specific earnings expectations are too high. In their case, they examine whether management's guidance about a firm's earnings can help resolve overvaluation driven by market-wide investor sentiment. In our case, we consider whether firm-specific sentiment contained in news items – what we will refer to as 'media sentiment' – contributes to overvaluation in the first place.

We address two questions. First, does firm-specific media sentiment induce biased reactions to earnings news (controlling for market-wide investor sentiment)? Second, do firm-specific media sentiment and market-wide investor sentiment interact? Thus, our research extends Tetlock (2007) by examining the effects of media sentiment at the firm level and complements MS and Seybert and Yang (2012) by examining whether the effects of market-wide investor sentiment are moderated, reinforced, or unaffected by firm-specific media sentiment.

Regarding the first question, we expect that firm-specific media sentiment will directly affect the mispricing of earnings news. Most studies link investor sentiment to periods of market-wide optimism and pessimism. These bubble and bust periods can lead to mispricing either by affecting cross-sectionally the propensity to speculate or the ability to arbitrage, and Baker and Wurgler (2006) show their investor sentiment proxy, which we use in this paper to control for market-wide sentiment, roughly aligns with past peaks and troughs periods in the stock market. However, macroeconomic conditions change slowly while the news about a firm can change daily and even by the minute. Thus, logic would suggest that media sentiment would have an effect on investor psychology that is separate from market-wide sentiment.

We also expect that the effect of media sentiment on mispricing will be more pronounced for stocks that have uncertain cash flows and are hard to value. In such a case, investors are more likely to be swayed by the tone or sentiment in firm-specific news reports because they have less hard information to rely on. In relation to market-wide investor sentiment, Baker and Wurgler (2006) find that hard-to-value firms including small firms, young firms, firms with high return volatility, unprofitable firms, and firms that do not pay dividends have lower returns than firms that are easier to value following months with high investor sentiment. Whether firm-specific media sentiment leads to similar mispricing is an empirical question.

Regarding the second question, we examine whether media sentiment and investor sentiment interact. On one hand, they may be independent since at a basic level investor sentiment contains a market-wide component that can affect the mispricing of many stocks (e.g., Stambaugh, Yu, and Yuan 2012) while media sentiment relates to the optimism or pessimism toward a single stock, i.e., it is idiosyncratic. On the other hand, they may be related since investor sentiment reflects the broader social mood, and this can affect investor behavior generally, e.g., it can affect their trading activity (e.g., Baker and Stein 2004) and expectations about future firm performance (e.g., Shiller 2000, Nofsinger 2005). As such, investors' response to media sentiment might be conditioned on the prevailing investor sentiment.

We use data from Thomson Reuters' News Analytics (TRNA) database from January 2003 to December 2011 to compute a measure of firm-specific media sentiment. TRNA uses a text processing engine to score a news item based on its tone or sentiment in real-time. Each news item receives a score for positive and negative sentiment, separately. The score for each type of sentiment ranges from 0 (no sentiment) to 1 (high sentiment). The sentiment scores capture the "sentiment expressed by the author about the subject matter being discussed"

(Thomson Reuters 2013, 6). That is, given the same facts, one journalist could interpret them positively, while another could interpret them negatively.

For every firm in our sample, we compute a net sentiment score for the 30 days prior to the earnings announcement as the difference between the aggregate positive sentiment scores and the aggregate negative sentiment scores for the 30 days, scaled by total news items during that period. Since the net media sentiment will reflect the firm's fundamentals to some degree (e.g., Tetlock, Saar-Tsechansky, and Mackassy 2008), we regress the net sentiment score on return on assets, book-to-market ratio, size, change in net operating assets, and dividend yield for the prior quarter (e.g., Li, Richardson, and Tuna 2012). We use the residuals from these regressions as a measure of firm-specific media sentiment, i.e., the excessive optimistic or pessimistic tone of news items that is not supported by underlying fundamentals.

To measure market-wide investor sentiment, we use Jeffrey Wurgler's estimates.[1] His index is computed by regressing each of six individual investor sentiment measures on growth in industrial production, growth in durable, nondurable, and service consumption, growth in employment, and an indicator for recessions, and taking the first principal component of the residuals from the six regressions. Conceptually similar to our media sentiment variable, the investor sentiment index represents the market-wide mood after stripping out the macroeconomic component.

We compute the earnings surprise as the seasonally differenced earnings change, i.e., the difference between actual quarterly earnings less same quarter earnings in the prior year divided by the end of quarter share price, consistent with Livnat and Mendenhall (2006). We compute the cumulative abnormal return (CAR) for a -1 to +1 window around the earnings announcement

[1] We thank Jeffrey Wurgler for making the data available on his website, http://pages.stern.nyu.edu/~jwurgler/.

date. We adjust CARs for size, book-to-market ratio, and past returns momentum. To examine the effect of media sentiment on the ERC (our first research question), we adapt MS's model and regress the CAR on indicators for good and bad earnings news, interactions between the good/bad earnings news indicators and firm-specific media sentiment in the month prior to the earnings announcement, investor sentiment, and control variables. To examine the interrelation between media and investor sentiment (our second research question), we include three-way interactions between the earnings surprise, media sentiment, and investor sentiment. We also estimate our main model separately for subsamples based on extreme market-wide investor sentiment.

We find that positive firm-specific media sentiment increases (decreases) the market's reaction to good (bad) unexpected earnings while negative firm-specific media sentiment increases (decreases) the reaction to bad (good) unexpected earnings, after controlling for market-wide investor sentiment. We find that these results are driven by firms that have greater valuation uncertainty. Further, we find that no evidence of an interaction between media sentiment and investor sentiment. For example, we find that media sentiment is significantly related to mispricing both when market-wide investor sentiment is extremely low and extremely high. These latter results indicate that media sentiment is a separate sentiment factor and is not a disguised form of investor sentiment.

An alternative explanation for our results is that our media sentiment measure captures additional information that is not captured by fundamentals (e.g., information about strategies, new products, mergers and acquisitions, future growth), rather than sentiment per se. We address this concern in several ways. First, we consider whether the interaction between unexpected earnings and media sentiment explains future earnings or future cash flows. Second,

we consider the reversal of earnings announcement CARs in the post-earnings announcement period. Third, we investigate whether media sentiment is correlated with contemporaneous analysts' earnings forecast errors. Fourth, we partition our sample based on media sentiment, i.e., the residual from our first-stage regression where we regress the raw media sentiment on the firm's fundamentals. Fifth, we use analysts' forecast revisions in the 30 days before the earnings announcement as a proxy for other information not captured by our controls for fundamentals. None of the results from these additional analyses support the information story.

Our study contributes to several strands of literature. First, we contribute to the substantial literature on behavioral finance by introducing and testing a firm-specific measure of investor sentiment. Second, we contribute to a much smaller literature that examines the effects of investor sentiment in an accounting context (e.g., Brown, Christensen, Elliott, and Mergenthaler 2011, Hribar and McInnis 2012, MS 2012, Seybert and Yang 2012). We extend this literature by examining the joint effects of firm-specific media sentiment and market-wide investor sentiment on the stock price sensitivity to earnings news. Third, we contribute to a growing literature on the business press (e.g., Tetlock 2007, Tetlock et al. 2008, Fang and Peress 2009, Kothari, Li, and Short 2009, Bushee, Core, Guay, and Hamm 2010). Except for Tetlock (2007), these studies focus on the information contained in news items. Similar to Tetlock (2007), we focus on the sentiment contained in news items, but in contrast to Tetlock, we focus on firm-specific media sentiment rather than market-wide sentiment.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature and identifies research questions. Section 3 describes the research design. Section 4 provides results. Section 5 concludes.

2. Background and research questions

MS find that the stock market's response to unexpected earnings around the earnings announcement date is affected by market-wide investor sentiment. In particular, they find that when investor sentiment is positive, investors overreact to good earnings news and underreact to bad earnings news, consistent with investors being too optimistic. On the other hand, when investor sentiment is negative, investors overreact to bad earnings news while underreacting to good earnings news, suggesting that they are too pessimistic. In other words, they find a positive (negative) relation between investor sentiment and the earnings response coefficient (ERC) for good (bad) news.

Clearly, market-wide sentiment and media sentiment are not identical. Within any period of market-wide sentiment (e.g., a boom period), we would expect cross-sectional differences in media sentiment, since macroeconomic conditions affect firms differently, and time-series differences in media sentiment, since a firm's prospects can change over time. Dougal et al. (2012, 641) conclude that financial journalist can 'causally influence stock returns, even more so during times of extreme market sentiment'. However, their focus is on aggregate stock returns – the DJIA index – and, similar to Tetlock (2007), they examine a single news item – the 'Abreast of the Market' column published in *The Wall Street Journal*. Thus, our first research question examines whether, controlling for market-wide sentiment, media sentiment in general affects firm-specific stock returns. Following MS, we consider whether firm-specific media sentiment affects the stock price sensitivity to unexpected earnings (i.e., the ERC). If media sentiment psychologically affects investor through the same channels as market-wide sentiment, where positive (negative) sentiment engenders excessive optimism (pessimism) about a stock, we expect that positive firm-specific sentiment will increase the ERC when unexpected earnings are

positive and that negative firm-specific sentiment will increase the ERC when unexpected earnings are negative, after controlling for market-wide sentiment.

Our second research question focuses on whether media and market-wide investor sentiment interact. That is, we consider whether media sentiment has a different effect on the stock price sensitivity to unexpected earnings when market sentiment is high than it does when market sentiment is low. While media sentiment and investor sentiment may act independently, psychology research on directional preferences in information processing (e.g., Kunda 1990) suggests that investors will pay more attention to media sentiment when it conflicts with the prevailing market sentiment, e.g., negative media sentiment at a time when market sentiment is positive. The conflicting sentiments can force the investor to consider the firm's fundamentals more closely which can neutralize psychological biases (e.g., Ditto and Lopez 1992, Dawson, Gilovich, and Regan 2002), leading to less stock mispricing. Recently, Hales et al. (2011) find evidence that investors exhibit 'motivated sensitivity' in accounting setting where they are more sensitive to differences in the tone of language in disclosures when the information is inconsistent with their prior beliefs. If consistency between media and investor sentiment leads to less scrutiny of fundamentals by investors, mispricing will be greater when media and market-wide investor sentiment are consistent.

In addition, other psychological traits such as conservatism, representativeness, and confirmatory bias predict that investors overweight new information that is consistent with their prior beliefs. For example, Barberis, Shleifer, and Vishny (1998) develop a model that investors may fail to revise prior sentiment because of representativeness (ignoring evidence that is contrary to a prior classification) and conservatism (slow updating of their models after receiving new information). Hirshleifer (2001) argues investors rationalize inconsistent facts and may

place too much weight on or seek out confirmatory information as a result of a confirmatory bias. Similar to above, if more consistency between media and investor sentiment leads to confirmatory bias among investors, mispricing will be greater when media and investor sentiment are consistent.

3. Data and Method

We construct a measure of firm-specific media sentiment (*MediaSent*) using data from TRNA. TRNA is a database of news items where each news item has been scored on three sentiment dimensions, i.e., positive, negative, and neutral. TRNA uses a three-stage process to assign sentiment scores: pre-processing, feature extraction, and classification.

Pre-processing involves five steps. First, the news item is split into sentences. Second, each sentence is divided into words and punctuation marks called lexical tokens. Third, the tokens are classifying into categories based on part of speech, e.g., noun, verb, adjective. Fourth, each noun and verb are reduced to their base-form. For example, "firms" is associated with the singular form "firm", and "achieves", "achieving", and "achieved" are associated with "achieve". Fifth, a shallow parse is conducted on the sequence of tokens to combine them into phrases or sub-sequences that have syntactic roles such as subject, verb, and object.

Feature extraction isolates the sentiment features of the news item by identifying the tokens or phrases in a sentence that are most important for conveying sentiment. It begins with a lexical analysis where tokens are analyzed alone or in conjunction with other tokens (in the case of phrases) and compared to a dictionary of 16,000 words and 2,500 phrases that have sentiment meaning based on the ratings of three human annotators. In this stage, the actual tokens and phrases are replaced with sentiment tags. Subsequently, the shallow parse tree is analyzed to identify sentiment relevant structures or patterns in a phase called sentiment processing. In other

words, the sentiment not just based on the sentiment tagged to tokens or phrases, but rather the sentiment engine also considers how the syntactic elements relate to one another. For example, the sentiment engine takes in account instances of negation, e.g., "not well" or "did not go well". Likewise, it also considers intensification where the meaning of a token can be strengthened or modified and verb resolution where sentiment can differ for the subject and object of the same verb (e.g., "X outperformed Y" which is positive for X and negative for Y).

Classification involves assigning sentiment scores for each entity named in the news item. That is, while the feature extraction phase analyzes the sentiment of the individual elements in a news item, in the classification phase, a sentiment score is assigned to the overall news item. The sentiment score is not just count the number of positive and negative sentiment features in the news item since some features may be more critical than other features. Instead, TRNA employs a three-layer back-propagation neural network with weight relaxation that has been trained using 5,000 news articles that have been scored by three humans. The final output is three sentiment scores, ranging from 0 to 1, that reflect the probability that the news item is positive, negative, or neutral (the three scores sum to 1) which, according to TRNA, captures "whether the author thinks the company is doing well or not" (Thomson Reuter 2013, 6).

Overall, TRNA claims that the ratings from its sentiment engine agrees with ratings made by humans 75 percent of the time, which is only marginally lower than the 82 percent agreement rate for a pair of human raters. The entire rating process takes 0.1 seconds per news item.

TRNA identifies the source of the news item. Similar to Bushee et al. (2010), we separate news items into press initiated or firm initiated where the latter are those items that were carried on a press release wire (e.g., Business Wire, Prime Newswire, PR Newswire). Kothari et al. (2009) argue that firm-initiated disclosures are likely to be self-serving, especially if they

involve good news, and they find that press-initiated news items are viewed as more credible than management disclosures which suggests that the sentiment in press-initiated and firm-initiated news items is likely to be viewed differently by investors.

TRNA also provides a relevance score for each entity mentioned in an item. The relevance score ranges from 0 to 1 where a higher score indicates greater relevance. For example, if an article about Microsoft mentions several of its competitors, Microsoft would receive a high relevance score while its competitors would receive low relevance scores. Since investors have limited attention (e.g., Hirshleifer and Teoh 2003) and since the number of news items is vast, we expect that, when assessing the media's sentiment toward a particular company, investors will rely on news items that focus on that particular company, i.e., where the relevance score is equal to 1. In addition, TRNA gives a novelty score to each news item that reflects how related the item is to other items that appeared in a previous window period (e.g., 12 hours, 24 hours, 3 days, 5 days, 7 days). Again, because of limited attention, we expect that investors will focus on novel news items which we define as news items that are not linked (related) to a prior news items in the previous 24 hours.[2]

Since we are interested in sentiment, we want to be sure that the sentiment score we use is not related to the firm's fundamentals. Firms performing well are likely to engender more positive sentiment. Thus, analogous to Baker and Wurgler (2006) who regress their market sentiment measure on macroeconomic indicators and use the residual in their analysis, we regress the TRNA sentiment score on firm-level fundamentals. Specifically, we estimate the following model:

$$Sent_{it} = \alpha_0 + \alpha_1 Size_{it} + \alpha_2 ROA_{it} + \alpha_3 BM_{it} + \alpha_4 Lev_{it} + \alpha_5 DivYield_{it} + \alpha_6 ChgNOA_{it} + \varepsilon_{it}, \quad (1)$$

[2] Our results hold when we relax this requirement so that the relevance score is greater than 0.80 and the number of related items in the prior 24 hour period can be up to two.

where *Sent* is either *Sent_Media*, the total positive sentiment scores initiated by the press within 30 days before the earnings announcement date minus total negative sentiment scores within 30 days before the earnings announcement date initiated by the press, scaled by total press initiated news articles, or *Sent_Firm*, the total positive sentiment scores initiated by the firm within 30 days before the earnings announcement date minus total negative sentiment scores within 30 days before the earnings announcement date initiated by the firm, scaled by total firm initiated news articles.[3] In our context, it is important to control for firm-initiated sentiment because TRNA includes news items issued by presswires that are produced directly by the firm. Solomon (2012) shows that the way a firm 'spins' its own news can affect its share price.

When *Sent_Media* is the dependent variable, we use the residual from equation (1) as a measure of firm-specific press-initiated media sentiment. We label this as *MediaSent*. When *Sent_Firm* is the dependent variable, we use the residual from equation (1) as a measure of the sentiment in firm-initiated news items, i.e., the firm's own sentiment. We label this as *OwnSent*. Note that we compute *MediaSent* and *OwnSent* for each quarterly earnings announcement so, for a particular firm, both variables vary over time.

The control variables in equation (1) are as follows. *Size* is the log value of total assets (Compustat item ATQ) in the prior quarter. *ROA* is the net income before extraordinary item (IBQ) divided by total assets (ATQ) in the prior quarter. *BM* is the book-to-market ratio in the prior quarter which is calculated as the book value of common equity (CEQQ) divided by the market value of common equity defined as the closing price of the common shares at the end of the quarter (PRCCQ) times the common shares outstanding (CSHPRQ). *Lev* is the leverage ratio in prior quarter, defined as the sum of long-term liability (DLTTQ) and the debt in current

[3] We use a 30-day window to be consistent with Tetlock et al. (2008). In robustness tests, we also use 15- and 7-day windows and obtain similar results. Our results are also unchanged if we define media sentiment using the median rather than the mean.

liability (DLCQ) divided by total assets (ATQ). *DivYield* is the dividend yield in the prior quarter, defined as dividend per share (DVPSXQ) divided by the closing price of the commons shares at the end of the quarter (PRCCQ). *ChgNOA* is the change in net operating assets in last quarter, defined as the change of net operating assets, scaled by total assets (ATQ), where net operating assets are calculated as operating assets (total assets (ATQ) less the sum of cash and investments (CHEQ)) minus operating liabilities (total liability (LTQ) minus total long-term debt (DLTTQ) and the debt in current liability (DLCQ)).

We compute the CAR for a -1 to +1 window around the earnings announcement date and adjust CARs for size, book-to-market ratio, and past returns momentum. Similar to MS, we regress the earnings announcement CAR on earnings surprise variables and market sentiment but we add *MediaSent* and *OwnSent* and the interactions between these variables and the earnings surprise to their model:

$$\begin{aligned} CAR_{it} = {} & \beta_0 + \beta_1 Down_{it} + \beta_2 UEUp_{it} + \beta_3 UEUp_{it} \times MktSent_{t-1} + \beta_4 UEUp_{it} \times MediaSent_{it} + \\ & \beta_5 UEUp_{it} \times OwnSent_{it} + \beta_6 UEDown_{it} + \beta_7 UEDown_{it} \times MktSent_{t-1} + \\ & \beta_8 UEDown_{it} \times MediaSent_{it} + \beta_9 UEDown_{it} \times OwnSent_{it} + \beta_{10} NonlUp_{it} + \beta_{11} UEUp_{it} \times MktPE_{t-1} \\ & + \beta_{10} NonlDown_{it} + \beta_{11} UEDown_{it} \times MktPE_{t-1} + \varepsilon_{it}, \end{aligned} \quad (2)$$

where *CAR* is the earnings announcement CAR. *UE* is the current quarter earnings minus same quarter earnings in the prior year, scaled by stock price at the end of the current quarter.[4] *UEUp* (*UEDown*) is the product of *UE* and an *Up* (*Down*) indicator variable that is equal to 1 if *UE* is positive (negative) and 0 otherwise. *MktSent* is the monthly Baker-Wurgler Sentiment Index at the start of the current month. *MediaSent* is press-initiated firm-specific sentiment, computed as the residual from equation (1) where *Sent_Media* is the dependent variable. *OwnSent* is firm-

[4] For robustness, we also consider a definition of unexpected earnings based on analysts' forecasts.

initiated sentiment, computed as the residual from equation (1) where *Sent_Firm* is the dependent variable. *NonlUp* is the square of *UEUp*. *NonlDown* is the square of *UEDown* multiplied by -1. *MktPE* is the aggregate stock market price-to-earnings ratio (PE) in the prior month minus the mean market PE over the prior 12 months.

In their study which does not include media sentiment or firm-initiated sentiment, MS find a positive and significant coefficient on *UEUp*x*MktSent* which indicates that the market responds more strongly to positive earnings surprises when investor sentiment is high, and they report that the coefficient for *UEDown*x*MktSent* is negative and significant, suggesting a stronger response to negative earnings surprises when investor sentiment is low. In contrast, we are interested in interactions between unexpected earnings and media sentiment, β_4 and β_8, which examine the effect of press-initiated media sentiment on the relation between unexpected earnings and the earnings announcement CAR. If positive (negative) media sentiment causes investors to be too optimistic (pessimistic) about a firm's prospects, we expect that β_4 (β_8) will be positive (negative).

We consider our second research question in two ways. First, we add two three-way interactions, i.e., *UEUp*x*MediaSent*x*MktSent* and *UEDown*x*MediaSent*x*MktSent*, to equation (2). Second, we partition the sample based on investor sentiment and estimate equation (2) for two subsamples with lowest and highest investor sentiment.

4. Results

4.1 Main findings

We use news data from Jan 2003 to Dec 2011. As mentioned above, we require the news data to be within 30 days before the earnings announcement date and be relevant (with relevance score equal to 1) and novel (with number of related items in the prior 24 hour period equal to 0).

After this screening process, we have 34,107 earnings announcements with 168,766 press-initiated news items coverage, and 14,728 earnings announcements with 73,279 firm-initiated news items coverage. As our data analysis requires the earnings announcement events to have both the press-initiated news coverage and firm-initiated news coverage at the same time, this reduces our sample into 13,173 earnings announcements. In addition, in our first-stage regression, we require data from Compustat for our control variables, leading to a final sample size of 9,629 earnings announcements related to 1,779 unique firms.

Table 1 provides the descriptive statistics and correlations for the first stage variables. In panel A, the mean for *Sent_Media* is 0.276. Since *Sent_Media* is the cumulative difference in the positive and negative sentiment scores for each news item in the 30 days before an earnings announcement, scaled by the total number of news items, a positive mean indicates that press-initiated news items are positive on average. Interestingly, the mean for *Sent_Firm* is only 0.055. While the firm-initiated news items (i.e., press releases issued by the firm) are generally positive, they are much less positive than the press-initiated items. This is contrary to the view that firm-initiated news will be more optimistic and that managers are more likely to release good news than bad news. One explanation is that *Sent_Firm* captures the firm's mandatory disclosures and the firm must make these disclosures whether they are positive or negative.

The Pearson and Spearman correlations in Table 1, panel B indicate that *Sent_Media* is positively and significantly correlated with firm size, profitability, growth, and dividends, and negatively and significantly correlated with leverage. Thus, firms that are large, have higher ROAs, are faster growing, have higher dividend yields, and have lower leverage generate more positive news, possibly because they have strong fundamentals. In other words, *Sent_Media* is a partly a function of the news flow, and the news flow will naturally be more positive for firms

with strong fundamentals since they have more good news to report. These correlations support our decision to estimate media sentiment using a two-stage approach where we strip out that portion of media sentiment that is related to fundamentals.

The correlation between *Sent_Media* and *Sent_Firm*, while significant, is only 0.082 based on a Pearson correlation. The relatively low correlation probably reflects the selectivity in the news reporting process. That is, news outlets must screen thousands of potential news items and decide on which ones to report. Bushee et al. (2010) find evidence that the press is more likely to cover large firms, growth firms, and firms covered by more analysts, with more employees, and with more owners. The relatively modest correlation between the two sentiment measures suggests that while the sentiment in press-initiated and firm-initiated news agree some of the time, there is substantial variation in tone of press reports compared to the firm's own reports. Finally, we find that *Sent_Firm* is negatively and significantly correlated with *Size*. Thus, small firms have firm-initiated news items that are more optimistic.

Table 2 provides the results for our first-stage regression where we regress *Sent_Media* or *Sent_Firm* on firm fundamentals. For *Sent_Media* (Table 2, columns 1 and 2), all of the fundamental variables are significant, except for *BM* and *ChgNOA*. The signs for *Size*, *Lev*, *DivYield*, and *ROA* are consistent with the pairwise correlations reported in Table 1, panel B.

Overall, the model explains 6.3 percent of the variation in *Sent_Media*. Thus, while it is important to control for fundamentals, a hefty portion of the TRNA sentiment scores reflects the tone the press uses to convey news to the reader, a finding that is consistent with TRNA's marketing material. We use the residual from equation (1) as our estimate of press-initiated sentiment (*MediaSent*).

Table 2, columns 3 and 4 report the results where the dependent variable is *Sent_Firm*. The significant coefficients on *Size, ROA, DivYield* and *BM* indicate that small firms, more profitable firms, high growth firms and firms paying more dividends provide press releases with a more positive tone. The R^2 for the *Sent_Firm* model is 4.9 percent. Similar to *MediaSent*, we use the residual from this model as our measure of firm-initiated sentiment (*OwnSent*).

Table 3 provides the descriptive statistics and correlations for the variables in the second stage regression model. In panel A, we find a mean *CAR* of 0.578 percent and the mean earnings surprise (*UE*) is 0.006 in our sample; both figures are comparable to MS. The mean *UEUp* is 0.008 versus -0.002 for *UEDown*. The means of *MediaSent* and *OwnSent* are both zero which is expected since, in each case, we use the residual from a version of equation (1), but *MediaSent* has a higher median than *OwnSent* (0.034 and 0.000 respectively). In addition, *MediaSent* has a larger interquartile range (-0.193 to 0.208) compared to *OwnSent* (-0.061 to 0.100), indicating that *MediaSent* has a flatter distribution.

In Table 3, panel B, neither *MediaSent* nor *OwnSent* are significantly correlated with *CAR*. In the case of *MediaSent*, the insignificant correlation is not surprising since we expect that the effect of *MediaSent* is conditioned on the sign of the unexpected earnings. Notably, *MediaSent* is not significantly correlated with market-wide sentiment, *MktSent*, suggesting that firm-specific media sentiment is a separate dimension of investor sentiment. On the other hand, *OwnSent* and *MktSent* are significantly correlated based on the Spearman correlation, although they are not significantly correlated based on the Pearson correlation. In the case of the Spearman correlation, firms tend to be more positive in their own press releases when market-wide sentiment is low. Although the correlation is not high (r = -0.081), this correlation is

consistent with Seybert and Yang (2012) who find that management earnings guidance aids in resolving sentiment-driven overvaluation.

We first estimate a reduced version of equation (2) that is identical to MS's equation (2). This allows us to benchmark our results to theirs, which is important since our time period (2003-2011) is shorter and more recent than theirs (1972-2007). Table 4, columns 1 and 2 provide these results. As MS point out because the CARs are computed in accord with Daniel, Grinblatt, Titman, and Wermers (1997) and adjusted for size, book-to-market, and past return momentum, the interactions capture the differential effects of market-wide sentiment for announcing firms compared to non-announcing firms.

As expected, the coefficients for *UEUp* and *UEDown* are both positive and highly significant. Further, the interaction between *UEDown* and *MktSent* has a negative and significant coefficient, indicating that investors respond more negatively to negative unexpected earnings when market sentiment is low. These findings are consistent with MS. However, unlike MS, we do not find a positive and significant coefficient for *UEUp*x*MktSent* , i.e., we do not find that the ERCs for firms with positive unexpected earnings are higher when market sentiment is high. The difference is likely due to the higher growth rate in GDP for the period 1972-2002, which is included in their sample but not ours. For example, the annual growth rate for their sample period, 1972-2002, was 3.09 percent while for our sample period, 2003-2011 which includes the global financial crisis, the annual growth rate was 1.53 percent. Moreover, there are fewer quarters with extreme annual GDP growth rates of 4 percent or higher in our sample, i.e., just 1 quarter in 8 years (0.125 per year) for our period, 2003-2011, compared to 55

quarters in the 36 years from 1972-2007 (1.53 quarters per year). Thus, their sample is characterized by higher growth, suggesting more positive market-wide sentiment.[5]

Of greater interest is the full model that includes *MktSent*, *MediaSent*, and *OwnSent*. These results are reported in Table 4, columns 3 and 4. As expected, we find that both *UEUp* and *UEDown* have positive and significant coefficients. More importantly, we find our first coefficient of interest, *UEUp*x*MediaSent*, is positive and significant after controlling for the market-wide sentiment in the model, consistent with investors overreacting to positive earnings surprises when firm-specific media sentiment is high. Thus, we find a positive and significant coefficient for *UEUp*x*MediaSent* even though *UEUp*x*MktSent* is not significant. Our second coefficient of interest, *UEDown*x*MediaSent*, is negative and significant, suggesting that investors overreact to negative earnings surprises when firm-specific media sentiment is low. In this case, *UEDown*x*MktSent*, which had a negative and significant coefficient in the reduced model (columns 1 and 2), is not significant when firm-specific media sentiment is include. These findings are consistent with the journalistic tone in firm-specific news items having an effect on investor behavior, and suggest that firm-specific media sentiment may be a better measure of investor sentiment than the market-wide measures used in prior research.

On the other hand, both *UEUp*x*OwnSent* and *UEDown*x*OwnSent* are not significant. The tone or spin in firm-initiated news items (press releases) does not affect the market's reaction to positive or negative unexpected earnings, consistent with the market viewing these disclosures as biased and optimistic. These findings are consistent with Kothari et al. (2009) who find that management forecasts do not reduce firms' cost of capital while news items do.

[5] MS report that the mean market-wide sentiment of 0.048 for their sample period (MS, Table 1, p. 1365) while the mean for our sample period is -0.051.

To examine the economic impact of media sentiment, we consider how *UEUp* and *UEDown* change when *MediaSent* increases or decreases by one standard deviation, while holding *MktSent* and *OwnSent* constant. A standard deviation change in *MediaSent* results in a change in *UEUp* of 0.050 (0.288 x 0.174). Adding this amount to the coefficient of *UEUp* is 0.226; subtracting this amount from the coefficient of *UEUp* is 0.126. Thus, the slope of *UEUp* decreases by 44.25 percent moving from highly positive media sentiment to highly negative media sentiment (i.e., (0.226 – 0.126)/0.226), consistent with investors overreacting to good earnings news when the tone of news items is more positive. For *UEDown*, the comparative figures for a one standard deviation change in *MediaSent* is a change in *UEDown* of -0.059 (0.288 x -0.205). Adding this amount to the coefficient of *UEDown* is 0.098; subtracting this amount from the coefficient of *UEDown* is 0.216. Thus, the slope of *UEDown* decreases by 54.63 percent moving from highly negative media sentiment to highly positive media sentiment (i.e., (0.216 – 0.098)/0.216), indicating that the market overreacts to bad earnings news when media sentiment is more negative.

This analysis suggests that the effect of media sentiment is slightly more pronounced for bad earnings than for good earnings news, i.e., the absolute value of the effect of a one standard deviation change around the mean of *MediaSent* is 44.24 percent for positive earnings surprises and 54.63 percent for negative earnings surprises. This is somewhat consistent MS's results for market-wide sentiment. They find that that a one standard deviation change in market-wide sentiment leads to a bigger change in the stock price sensitivity to for negative surprises than for positive surprises, a result that they try to attribute to the greater uncertainty of bad news.

For robustness, we also define unexpected earnings relative to analysts' forecasts. Specifically, we use the difference between actual earnings and the consensus analyst forecast

scaled by the period's beginning stock price in place of the random walk unexpected earnings. Because of data limitation, this reduces our sample from 9,629 firm-quarter observations to 8,854 firm-quarter observations. Table 4, columns 5 and 6 present these results. The coefficient for *UEUp*x*MediaSent* is 1.122 and the coefficient for *UEDown*x*MediaSent* is -0.813, and both coefficients are significant at the 5 percent level. One difference between the results for the analyst-based unexpected earnings and the random walk unexpected earnings is that the coefficient for *UEDown*x*MktSent* is negative and significant in the former model, although its significance is lower relative to the reduced model in Table 4, columns 1 and 2.

Although we attempt to purge *MediaSent* of the effects of fundamentals, it is possible that our media sentiment measure captures additional information that is not captured by fundamentals (e.g., information about strategies, new products, mergers and acquisitions, future growth). If this non-fundamental information is correlated with the earnings surprise, an alternative explanation for our results is that our fundamentals-adjusted measure of media sentiment has information content. We address this concern in five ways. First, we follow MS who use Kasznik and McNichols' (2002) model and examine whether *UEUp*x*MediaSent* and *UEDown*x*MediaSent* are associated with future earnings performance/future realized cash flow. Kasznik and McNichols' (2002) model considers whether the current earnings surprise is associated with future earnings or future cash flows. Thus, we estimate the following model for future earnings:

$$Earn_{it+n} = \beta_0 + \beta_1 LagEarn_{it-3} + \beta_2 UEUp_{it} + \beta_3 UEUp_{it} x MktSent_t + \beta_4 UEUp_{it} x MediaSent_t +$$
$$\beta_5 UEUp_{it} x OwnSent_{it} + \beta_6 UEDown_{it} + \beta_7 UEDown_{it} x MktSent_t +$$
$$\beta_8 UEDown_{it} x MediaSent_{it} + \beta_9 UEDown_t x OwnSent_{it} + \varepsilon_t, \quad (3)$$

where $Earn_{t+n}$ is future earnings per share before extraordinary items (Livnat and Mendenhall 2006) for the *n*th quarter ahead and $LagEarn_{t-3}$ is actual earnings for three quarters back. We consider up to eight quarters ahead so we estimate eight models where *n* equals 1 to 8. If media sentiment contains information about future earnings, β_4 (β_8) will be positive (negative) and significant. Such a finding would be consistent with the information content view.

Table 5, panel A contains the results for the eight models. We do not find any evidence supporting the information view. For *UEUp*x*MediaSent*, six of the eight coefficients are insignificant, while the coefficients for *t*+1 and *t*+2 are significant but incorrectly signed. For *UEDown*x*MediaSent*, all eight coefficients are insignificant.

We repeat this analysis for future realized cash flows from operations per share using a model similar to equation (3) except we also control for lagged cash flows, i.e., actual cash flows from operations from three quarters back. Table 5, panel B provides these results. All 16 coefficients for the interactions with media sentiment (*UEUp*x*MediaSent* and *UEDown*x*MediaSent*) are insignificant. Collectively, the results in Table 5 are not consistent with media sentiment containing information about future earnings or cash flows.[6]

Second, we consider the reversal of earnings announcement CARs in the post-earnings announcement period. Tetlock (2007) finds that the price impact of his measure of market-wide

[6] Although *LagEarn* and *Lag CFO* are not our main variables of interest, our results for these variables in Table 5 are broadly consistent with the results of Dechow, Kothari, and Watts (1998). In their Table 4 (Dechow et al. 1998, 150), they find that current annual earnings is incrementally useful in predicting future CFO over horizons of one, two, and three years, consistent with our Table 5, panel A. They also find the current cash flows are positively related to year-ahead CFO and negatively related to two- and three-year ahead CFO, consistent with our Table 5, panel B. Dechow et al. (1998) explain that a positive correlation between current and future CFO can arise because cash from a credit sale in the current period can increase the current and next period's cash flows. On the other hand, a negative correlation can arise because inventory may be purchased in the current period while the cash from its sale is received in the next period. One difference between our results and their findings is that they find that in explaining future CFO, current earnings has greater forecasting power than current CFO. In Table 5, panel B, we do not find this to be the case. However, their analysis is based on annual data whereas we use quarterly data. Because the accrual process between quarters differs compared to the accrual process between years (the former uses the integral method) and because quarterly earnings may be affected by seasonality, quarterly earnings may have less predictive power in our context.

media pessimism is fully reverse within one week. In contrast, an information story would predict no reversal since the new information would be permanently impounded into the stock price. We examine the returns over a 60-day period from t+2 in case there is a short-term continuation of the effect of firm-specific media sentiment in the post-earnings announcement period. We compute the 60-day cumulative abnormal return for the ten subsamples, namely the deciles of media sentiment, where the abnormal stock return is calculated using the 125 portfolios returns (size, MTB, and momentum) as the benchmark following Daniel, Grinblatt, Titman, and Wermers (1997). If the sentiment story holds, we expect to find smaller (larger) returns for the higher (lower) media sentiment subsample as the initial mispricing reverses. If the information story holds, we should find similar returns in the post-earnings announcement period since the initial returns would not reverse. Table 6, columns 1 and 2 report the 60-day CAR for the deciles of media sentiment. We find that the difference in the mean 60-day CAR for the highest (lowest) *MediaSent* deciles is -0.009 (0.011). The difference between the groups is significant at the 1 percent level and is consistent with a sentiment-based explanation, but not the information story.

Third, we investigate whether media sentiment is correlated with the simultaneous financial analyst earnings forecast error. Hribar and McInnis (2012) find that when market sentiment is high, analysts' forecasts of one-year ahead earnings and long-term earnings growth are relatively more optimistic for "uncertain" or "difficult-to-value" firms. If our media sentiment measure has a similar effect on analyst forecast error, we also expect our media sentiment measure to be positively correlated with analysts' optimistic forecasts. We examine this issue by comparing the analyst forecast errors for deciles of media sentiment. Table 6, columns 3 and 4 report the results. We find that analysts' forecast error, which is measured as the

difference between firms' actual earnings and the mean consensus analyst earnings forecast from I/B/E/S, scaled by the absolute value of the consensus EPS forecast (Hribar and McInnis 2012), becomes more negative (meaning more optimistic analyst forecasts) from the lowest decile of media sentiment to the highest decile of media sentiment. The difference between the lowest and highest groups is significant at the 1 percent level, which is also consistent with a sentiment-based explanation.

Fourth, we partition our sample based on the residual from our first-stage regression, i.e., equation (1). We scale the residual by the raw media sentiment so a smaller (larger) scaled residual indicates that fundamentals explain more (less) of the raw media sentiment. If the information story holds, there should be less (more) non-fundamental information when the scaled residual – i.e., *MediaSent/Sent_Media* – is small (large). As a result, the interaction of unexpected earnings and media sentiment should have a greater impact on the earnings announcement CAR when the scaled residual is large, if the information story holds.

Table 7 reports the results for equation (2) for two subsamples with low (columns 1 and 2) and high scaled residuals (columns 3 and 4). *UEUp*x*MediaSent* is positively signed, as expected, and is significant in both models. Similarly, *UEDown*x*MediaSent* has a significant negative coefficient in both models. These findings are consistent with our main results. However, we find that the difference in the coefficients between the groups is not significant for *UEDown*x*MediaSent* (-0.158, *t*-stat. = -1.05) or *UEUp*x*MediaSent* (-0.171, *t*-stat. = -1.62). This is inconsistent with information story which predicts that the impact of these interactions will be greater when the scaled residual is high.

Fifth, we expand equation (2) and control directly for analysts' forecast revisions made within 30 days of the earnings announcement. Specifically, we add two three-way interactions to

equation (2), *UEDown*x*AFRevisions* and *UEUp*x*AFRevisions*, where *AFRevisions* is the average analyst forecast revision, i.e., the latest analyst forecast less the second latest analyst forecast occurring within the 30 days before the earnings announcement. We use the analysts' forecast revision to proxy for the value relevant information not captured by our controls for fundamentals (e.g., information about strategies, new products, mergers and acquisitions, future growth) that is released in the month prior to the earnings announcement. If media sentiment is reflects this other information, *UEDown*x*MediaSent* or *UEUp*x*MediaSent* will lose significance once we control for analysts' forecast revisions.

Our results (untabulated) show that *UEDown*x*MediaSent* has a positive coefficient and remains significant at the 5 percent level whether we employ a random walk or analyst-based definition of unexpected earnings (coeff. = 0.146, *t*-stat. = 2.08, and coeff. = 1.127, *t*-stat. = 1.99, respectively). Similarly, we continue to find negative and significant coefficients for *UEUp*x*MediaSent* using random walk unexpected earnings (coeff. = -0.123, *t*-stat. = -1.86) and analyst-based unexpected earnings (coeff. = -0.090, *t*-stat. = -1.77). On the other hand, the interactions between analysts' forecast revisions and unexpected earnings are only significant in one of four cases. Although *UEUp*x*AFRevisions* is significant with a negative coefficient (-17.586, *t*-stat. = -2.24) in the random walk model, it is insignificant in the model using analyst-based unexpected earnings. Further, *UEDown*x*AFRevisions* is not significant in either model. These results are also inconsistent with an information story.

4.2 Additional analyses

To better understand the impact of media sentiment, we consider whether our results are more pronounced when there is more uncertainty about firm value. Baker and Wurgler (2006) find that hard-to-value firms including small firms, young firms, firms with high return volatility,

unprofitable firms, and firms that do not pay dividends have lower returns than more certain firms following months with high market-wide investor sentiment. MS find that market sentiment has a stronger effect on the ERC of small firms, young firms, firms with volatile returns, non-dividend paying firms, and firms with extreme growth as well as for firms they classify as "exposed" based on a composite measure. If media sentiment affects investor behavior in a way similar to market sentiment, we expect cross-sectional differences in the sensitivity of the ERC to media sentiment based on the uncertainty of firm value.

We compute a composite measure of exposure to sentiment following MS. Starting with five individual measures of value uncertainty – firm size, firm age, return volatility, dividends paying status, and extreme growth – we conduct a principle component analysis on the decile ranks of the five measures each year. More specifically, we adjust the ranks of all characteristics such that low ranks on each characteristic are associated with this stocks that are more affected by sentiment. We extract the first principle component and use this to assign firms into quintiles on a monthly basis and examine whether the top (exposed) and bottom (not exposed) quintile firms exhibit a different response in the ERC to media sentiment.

Table 8 reports the results for the sample partitioned based on uncertainty of firm value. Panel A contains the results for equation (2) for two subsamples – firms that are exposed (columns 1 and 2) and not exposed (columns 3 and 4) based on the definition above. For the 'not exposed' firms, none of the interactions with the market, media, and firm-initiated sentiment variables is found to be significant as predicted. Thus, investors are not influenced by any type of sentiment when firms are easy to value, i.e., sentiment does not have incremental explanatory power above and beyond unexpected earnings. However, for exposed firm, the story is different. The stock price sensitivity to positive earnings news increases with media sentiment. For

negative earnings surprises, for the exposed firms, *UEDown*x*MediaSent* is significant with a negative coefficient. The significant negative coefficient for *UEDown*x*MediaSent* is consistent with our main results.

In this specification, the interaction between positive surprises and market sentiment is also negative and significant. Further, there is a significant negative coefficient for *UEDown*x*MktSent*. These results indicate that the exposed firms have greater sensitivity to market-wide investor sentiment, consistent with Baker and Wurgler (2006), Hribar and McInnis (2012), and MS.

We also partition the sample based on the five individual measures since, based on the composite measure, it is not clear whether the results are driven by a few dimensions or whether each dimension exhibits a similar sensitivity to sentiment. As such, on an annual basis, we rank the sample by firm size, age, and return volatility and use the top and bottom quintiles to identify the hard and easy to value subsamples. For book-to-market ratio, we rank the firms and use the top and bottom quintiles for the hard to value subsamples since Baker and Wurgler (2006) find the relation between returns and growth is U-shaped. For dividend paying status, we identify all non-dividend paying firms and classify them as hard to value. We rank the remaining firms and use the top quintile of firms based on the dividend payout ratio as the easy to value subsample.

Table 8, panels B-F report the abbreviated results. The results are remarkably consistent across the subsamples. For the easy to value firms (i.e., large, old age, low volatility, high dividend, medium book-to-market ratio) in columns 1 and 2, *UEUp*x*MediaSent* and *UEDown*x*MediaSent* are never found to be significant. For the hard to value subsamples in columns 3 and 4, *UEUp*x*MediaSent* is always significant with a positive coefficient and *UEDown*x*MediaSent* is always significant with a negative coefficient. In contrast, for market-

wide sentiment, in the easy to value subsample, *UEUp*x*MktSent* and *UEDown*x*MktSent* are never significant. For hard to value firms in Table 8, panels B-F, *UEUp*x*MktSent* is found to be significant and *UEDown*x*MktSent* is found to be significant in some cases. These results are generally consistent with prior research on market-wide sentiment (e.g., Baker and Wurgler 2006, Hribar and McInnis 2012, MS).

Overall, the results in Table 8 paint a clear picture for media sentiment. For hard to value firms, investors always overreact to positive (negative) unexpected earnings when positive (negative) media sentiment is high. For easy to value firms, media sentiment is always unimportant. Also, we find evidence that market-wide investor sentiment affect the stock price sensitivity to unexpected earnings when media sentiment is controlled for, but only for hard to value firms. Finally, for the most part, the firm's own sentiment seems to similarly be ignored by investors when reacting to unexpected earnings news.

Next, we consider whether media sentiment and market sentiment interact. First, we re-estimate equation (2), but include two three-way interactions where we interact *UEUp* or *UEDown* with both *MediaSent* and *MktSent*. The sign of the three-way interactions depend on how investors view media sentiment in conjunction with market sentiment. If investors are affected by psychological traits such as representativeness and confirmatory bias, we expect a positive sign for *UEUp*x*MediaSent*x*MktSent* and a negative sign for *UEDown*x*MediaSent*x*MktSent* since they would lead to more mispricing when media and investor sentiment are in the same direction.

Table 9, panel A contains these results. Consistent with the previous results, *UEUp*x*MediaSent* and *UEDown*x*MediaSent* remain significant and *UEUp*x*MktSent* and *UEDown*x*MktSent* remain insignificant. More important, the two additional variables,

*UEUp*x*MediaSent*x*MktSent* and *UEDown*x*MediaSent*x*MktSent*, are insignificant, suggesting that investors view media sentiment as being independent of market sentiment. In other word, the relation between unexpected earnings (whether positive or negative) and media sentiment is unaffected by the prevailing market sentiment.

To further examine the relation between firm-specific and market-wide sentiment, we focus on periods with extreme market sentiment. We partition the sample based on *MktSent*, identify the top (bottom) quintile as the high (low) market sentiment subsample, and re-estimate equation (2). Table 9, panel B reports the results for the two subsamples. When market-wide sentiment is very low (columns 1 and 2), consistent with the main results in Table 4, *UEUp*x*MediaSent* and *UEDown*x*MediaSent* are significant with a positive and negative sign, respectively, and the interaction with market sentiment *UEUp*x*MktSent* is found to be significantly positive whereas the other interaction *UEDown*x*MktSent* is insignificant. When market sentiment is very high (columns 3 and 4), *UEUp*x*MediaSent* and *UEDown*x*MediaSent* remain statistically significant which reinforces the finding from panel A that the role of media sentiment is independent of market sentiment. However, *UEUp*x*MktSent* is insignificant. But *UEDown*x*MktSent* has a negative coefficient indicating that investors react more strongly to negative earnings surprises as market sentiment decreases. These two results are consistent with MS's results for market-wide sentiment and suggest that both media sentiment and market sentiment matter when market sentiment is high. When market sentiment is low, only media sentiment matters.

Overall, the results in Table 9 support the view that the effect of media sentiment is independent of market sentiment. This suggests that investors are not further biased by the

conflicting or confirmatory nature of the two types of sentiment. Importantly, these results indicate that media sentiment and investor sentiment are two distinct sentiment factors.

5. Conclusion

We propose and test a measure of firm-specific investor sentiment. Specifically, we examine whether the tone or sentiment contained in news items contributes to the mispricing of stocks around the earnings announcement date. To create a firm-specific measure of media sentiment, we use data from TRNA where news items are rated in real-time using text processing engine. TRNA gives each news item a positive and negative media sentiment score. We find that when the net fundamentals-adjusted media sentiment is positive, investors overreact to positive unexpected earnings. When net fundamentals-adjusted media sentiment is negative, investors overreact to negative unexpected earnings. We also find that this effect is more pronounced for hard to value firms including firms that are small, young, have high return volatility, pay no dividends, and have extreme book-to-market ratios. We find that media sentiment mispricing is separate and distinct from the market-wide investor sentiment mispricing found by MS, and we rule out an information based explanation for our results.

Our work extends the work of Tetlock (2007) and MS who examine the effects of investor sentiment. Our findings show that the optimism (after controlling for firm fundamentals) in stories written by the business press can lead investors to overreact (underreact) to positive (negative) unexpected earnings, while pessimism can lead investors to overreact (underreact) to negative (positive) unexpected earnings. Thus, our results show that, in addition to market-wide sentiment, individual firms are affected by a firm-specific sentiment that emanates from news coverage and is independent of the more general mood among investors. Interestingly, at least for the period we examine, the effects of media sentiment appear to

dominate the effects of investor sentiment. Similar to the way firm-specific news dominates market news in pricing securities, firm-specific media sentiment has a central role in explaining sentiment-based mispricing.

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Table 1
Descriptive Statistics and Correlations for Stage 1 Variables

Panel A. Descriptive statistics

Variable	Mean	Median	Std Dev	Lower Qtr.	Upper Qtr.
Sent_Media	0.276	0.307	0.310	0.062	0.506
Sent_Firm	0.055	0.043	0.305	0.005	0.153
Size	6.401	6.391	2.055	4.830	7.822
ROA	0.016	0.013	0.024	0.003	0.027
BM	0.591	0.415	0.484	0.249	0.818
Lev	0.187	0.153	0.179	0.017	0.298
DivYield	0.003	0.000	0.004	0.000	0.004
ChgNOA	0.000	0.000	0.036	-0.015	0.016

Panel B. Correlations

	Sent_Media	*Sent_Firm*	*Size*	*ROA*	*BM*	*Lev*	*DivYield*	*ChgNOA*
Sent_Media		**0.082**	**0.132**	0.029	**-0.069**	**-0.078**	0.006	0.005
Sent_Firm	**0.075**		-0.041	0.013	-0.024	-0.014	-0.019	-0.022
Size	**0.133**	**-0.057**		**0.180**	**-0.325**	0.014	**0.224**	-0.015
ROA	**0.049**	0.010	**0.227**		**-0.397**	**-0.304**	**-0.111**	0.011
BM	**-0.080**	-0.007	**-0.266**	**-0.525**		**0.128**	**0.141**	-0.019
Lev	**-0.080**	-0.002	**0.050**	**-0.376**	**0.116**		**0.280**	0.023
DivYield	**0.031**	-0.014	**0.352**	**-0.076**	**0.109**	**0.281**		-0.010
ChgNOA	0.008	-0.023	-0.019	-0.015	-0.009	0.019	-0.011	

Panel A provides descriptive statistics and Panel B provides Pearson (Spearman) correlations above (below) the diagonal for the first stage variables. In Panel B, the correlations in bold are significant at the 0.01 level.
Variable definitions: *Sent_Media* is the total positive sentiment scores initiated by the press within 30 days before the earnings announcement date minus total negative sentiment scores within 30 days before the earnings announcement date initiated by the press, scaled by total press initiated news articles. *Sent_Firm* is the total positive sentiment scores initiated by the firm within 30 days before the earnings announcement date minus total negative sentiment scores within 30 days before the earnings announcement date initiated by the firm, scaled by total firm initiated news articles. *Size* is the log value of total assets (Compustat item ATQ) in the prior quarter. *ROA* is the net income before extraordinary item (IBQ) divided by total assets (ATQ) in the prior quarter. *BM* is the book-to-market ratio in the prior quarter which is calculated as the book value of common equity (CEQQ) divided by the market value of common equity defined as the closing price of the common shares at the end of the quarter (PRCCQ) times the common shares outstanding (CSHPRQ). *Lev* is the leverage ratio in prior quarter, defined as the sum of long-term liability (DLTTQ) and the debt in current liability (DLCQ) divided by total assets (ATQ). *DivYield* is the dividend yield in the prior quarter, defined as dividend per share (DVPSXQ) divided by the closing price of the commons shares at the end of the quarter (PRCCQ). *ChgNOA* is the change in net operating assets in last quarter, defined as the change of net operating assets, scaled by total assets (ATQ), where net operating assets are calculated as operating assets (total assets (ATQ) less the sum of cash and investments (CHEQ)) minus operating liabilities (total liability (LTQ) minus total long-term debt (DLTTQ) and the debt in current liability (DLCQ)).

Table 2
Regressions Results for Equation (1) with Sent_Media and Sent_Firm

	DV = *Sent_Media*		DV = *Sent_Firm*	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
Intercept	0.146	10.15 ***	0.111	7.29 ***
Size	0.021	12.03 ***	-0.006	-3.46 ***
ROA	0.361	6.06 ***	0.300	4.75 ***
BM	0.006	0.89	-0.052	-6.82 ***
Lev	-0.116	-8.00 ***	-0.017	-1.10
DivYield	0.009	1.83 *	0.013	2.18 **
ChgNOA	0.058	0.74	-0.133	-1.60
N	9,629		9,629	
R^2	0.063		0.049	

The table provides the results for the first-stage regression model, i.e., equation (1). Columns 1 and 2 (3 and 4) provide the results for the model using *Sent_Media* (*Sent_Firm*) as the dependent variable. The residual from the *Sent_Media* model is a measure of press-initiated firm-specific sentiment (*MediaSent*). The residual from the *Sent_Firm* model is a measure of firm-initiated sentiment (*OwnSent*). *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. *t*-statistics are adjusted for clustering by month.
Variable definitions: *Sent_Media* is the total positive sentiment scores initiated by the press within 30 days before the earnings announcement date minus total negative sentiment scores within 30 days before the earnings announcement date initiated by the press, scaled by total press initiated news articles. *Sent_Firm* is the total positive sentiment scores initiated by the firm within 30 days before the earnings announcement date minus total negative sentiment scores within 30 days before the earnings announcement date initiated by the firm, scaled by total firm initiated news articles. *Size* is the log value of total assets (Compustat item ATQ) in the prior quarter. *ROA* is the net income before extraordinary item (IBQ) divided by total assets (ATQ) in the prior quarter. *BM* is the book-to-market ratio in the prior quarter which is calculated as the book value of common equity (CEQQ) divided by the market value of common equity defined as the closing price of the common shares at the end of the quarter (PRCCQ) times the common shares outstanding (CSHPRQ). *Lev* is the leverage ratio in prior quarter, defined as the sum of long-term liability (DLTTQ) and the debt in current liability (DLCQ) divided by total assets (ATQ). *DivYield* is the dividend yield in the prior quarter, defined as dividend per share (DVPSXQ) divided by the closing price of the commons shares at the end of the quarter (PRCCQ). *ChgNOA* is the change in net operating assets in last quarter, defined as the change of net operating assets, scaled by total assets (ATQ), where net operating assets are calculated as operating assets (total assets (ATQ) less the sum of cash and investments (CHEQ)) minus operating liabilities (total liability (LTQ) minus total long-term debt (DLTTQ) and the debt in current liability (DLCQ)).

Table 3
Descriptive Statistics and Correlations for Stage 2 Variables

Panel A. Descriptive statistics

Variable	Mean	Median	Std Dev	Lower Qtr.	Upper Qtr.
CAR	0.006	0.003	0.079	-0.032	0.042
Down	0.309	0.000	0.462	0.000	1.000
UE	0.006	0.002	0.029	-0.001	0.005
UEUp	0.008	0.002	0.027	0.000	0.005
UEDown	-0.002	0.000	0.007	-0.001	0.000
MediaSent	0.000	0.034	0.288	-0.193	0.208
OwnSent	0.000	0.000	0.306	-0.061	0.100
MktSent	-0.051	-0.019	0.265	-0.222	0.117
NonlUp	0.001	0.000	0.006	0.000	0.000
NonlDown	0.000	0.000	0.000	0.000	0.000
MktPE	1.443	0.872	2.678	0.749	1.155

Panel B. Correlations

	CAR	*Down*	*UE*	*UEUp*	*UEDown*	*MediaSent*	*OwnSent*	*MktSent*	*NonlUp*	*NonlDown*	*MktPE*
CAR		**-0.095**	**0.061**	**0.055**	**0.037**	0.009	-0.002	-0.016	**0.033**	-0.003	-0.012
Down	**-0.109**		**-0.308**	**-0.197**	**-0.523**	-0.009	**-0.084**	-0.017	**-0.087**	**0.270**	**-0.043**
UE	**0.120**	**-0.801**		**0.973**	**0.330**	0.014	**0.066**	-0.019	**0.898**	**-0.261**	0.024
UEUp	**0.121**	**-0.787**	**0.981**		**0.103**	0.006	**0.022**	**-0.027**	**0.935**	**-0.053**	0.021
UEDown	**0.106**	**-0.978**	**0.819**	**0.769**		0.013	**0.068**	**0.028**	**0.045**	**-0.904**	0.019
MediaSent	0.014	-0.006	0.006	0.001	0.011		**0.098**	-0.000	0.007	-0.009	-0.008
OwnSent	-0.009	**-0.065**	**0.067**	**0.066**	**0.065**	**0.089**		0.001	0.016	**-0.054**	**0.031**
MktSent	-0.008	-0.017	-0.002	-0.006	0.022	-0.001	**-0.081**		-0.021	-0.018	-0.006
NonlUp	**0.121**	**-0.787**	**0.981**	**1**	**0.769**	0.001	**0.066**	-0.006		-0.023	0.008
NonlDown	**-0.106**	**0.978**	**-0.819**	**-0.770**	**-1**	-0.001	**-0.066**	-0.022	**-0.769**		-0.008
MktPE	-0.006	**-0.081**	**0.070**	**0.065**	**0.086**	0.007	**0.023**	**0.188**	**0.065**	**-0.086**	

Panel A provides descriptive statistics and Panel B provides Pearson (Spearman) correlations above (below) the diagonal for the first stage variables. In Panel B, the correlations in bold are significant at the 0.01 level.

Variable definitions: *CAR* is the cumulative abnormal return for the -1, +1 window around the earnings announcement. *UE* is the current quarter earnings minus same quarter earnings in the prior year, scaled by stock price at the end of the current quarter. *UEUp* (*UEDown*) is the product of *UE* and an indicator variable that is equal to 1 if *UE* is positive (negative) and 0 otherwise. *MediaSent* is press-initiated firm-specific sentiment, computed as the residual from equation (1) where *Sent_Media* is the dependent variable. *OwnSent* is firm-initiated sentiment, computed as the residual from equation (1) where *Sent_Firm* is the dependent variable. *MktSent* is the monthly Baker-Wurgler Sentiment Index at the start of the current month.

NonlUp is the square of *UEUp* multiplied by -1. *NonlDown* is the square of *UEDown* multiplied by -1. *MktPE* is the aggregate stock market PE in the prior month minus the mean market PE over the prior 12 months.

Table 4
Regression Results for Reduced and Full Versions of Equation (2)

	MktSent only (MS Model)		Equation (2) (Random walk UE)		Equation (2) (Analyst-based UE)	
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Coefficient	*t*-stat.	Coefficient	*t*-stat.	Coefficient	*t*-stat.
Intercept	0.007	12.12***	0.006	6.15***	0.006	6.56***
Down	-0.014	-11.22***	-0.013	-7.93***	-0.013	-8.12***
UEUp	0.844	13.08***	0.176	2.32**	0.619	2.34**
UEUpxMktSent	0.056	0.71	0.036	0.17	0.197	0.22
UEUpxMediaSent			0.174	2.15**	1.122	2.46**
UEUpxOwnSent			0.057	0.54	0.172	0.84
UEDown	0.567	2.72***	0.157	2.26**	0.365	2.10**
UEDownxMktSent	-0.358	-2.28**	0.014	0.09	-1.517	-1.79*
UEDownxMediaSent			-0.205	-1.99**	-0.813	-1.96**
UEDownxOwnSent			-0.068	-0.90	-0.328	-1.46
NonlUp	-2.550	-9.95***	0.064	0.08	-1.749	-4.03***
UEUpxMktPE	0.009	3.11***	-0.008	-1.12	0.021	0.56
NonlDown	-18.160	-4.48***	-0.258	-2.13**	-0.031	-1.82*
UEDownxMktPE	-0.061	-3.27***	0.002	0.25	0.063	0.99
N	9,629		9,629		8,854	
R^2	0.033		0.039		0.041	

The table provides the results for the second-stage regression model, i.e., equation (2), where the dependent variable is *CAR* which is the cumulative abnormal return for the -1, +1 window around the earnings announcement. Columns 1 and 2 provide the results for reduced versions of equation (2) where only *MktSent* is included. Columns 3 and 4 (5 and 6) provide the results for equation (2) where unexpected earnings are based on a random walk (defined relative to analyst forecasts). *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. *t*-statistics are adjusted for clustering by both firm and month.

Variable definitions: In columns 3 and 4, *UE* is the current quarter earnings minus same quarter earnings in the prior year, scaled by stock price at the end of the current quarter. In columns 5 and 6, *UE* is the difference between actual earnings and the consensus analyst forecast scaled by the period's beginning stock price. *UEUp* (*UEDown*) is the product of *UE* and an indicator variable that is equal to 1 if *UE* is positive (negative) and 0 otherwise. *MediaSent* is press-initiated firm-specific sentiment, computed as the residual from equation (1) where *Sent_Media* is the dependent variable. *OwnSent* is firm-initiated sentiment, computed as the residual from equation (1) where *Sent_Firm* is the dependent variable. *MktSent* is the monthly Baker-Wurgler Sentiment Index at the start of the current month. *NonlUp* is the square of *UEUp* multiplied by -1. *NonlDown* is the square of *UEDown* multiplied by -1. *MktPE* is the aggregate stock market PE in the prior month minus the mean market PE over the prior 12 months.

Table 5
Regression Results for Equation (3)

Panel A: *Earn*								
	$Earn_{t+1}$	$Earn_{t+2}$	$Earn_{t+3}$	$Earn_{t+4}$	$Earn_{t+5}$	$Earn_{t+6}$	$Earn_{t+7}$	$Earn_{t+8}$
Variable	Coeff. (*t*-stat.)	Coeff. (*t*-stat.)	Coeff. (*t*-stat.)	Coeff. (*t*-stat.)	Coeff. (*t*-stat.)	Coeff. (*t*-stat.)	Coeff. (*t*-stat.)	Coeff. (*t*-stat.)
Intercept	0.143	0.161	0.196	0.202	0.173	0.210	0.219	0.229
	(15.44)***	(17.05)***	(20.57)***	(20.65)***	(17.86)***	(20.08)***	(20.55)***	(20.80)***
LagEarn	0.572	0.422	0.436	0.458	0.538	0.433	0.419	0.440
	(25.97)***	(19.50)***	(20.45)***	(20.45)***	(22.41)***	(17.39)***	(15.99)***	(16.51)***
UEUp	0.373	0.764	-1.116	-1.230	-0.132	-0.582	-0.114	-0.327
	(0.94)	(2.00)**	(-2.48)**	(-2.28)**	(-0.34)	(-1.34)	(-0.26)	(-0.62)
UEUpxMktSent	-2.267	-3.897	-1.522	-3.784	-2.632	-1.358	0.875	-1.213
	(-1.56)	(-2.98)***	(-1.06)	(-2.22)**	(-1.72)*	(-0.88)	(0.59)	(-0.98)
UEUpxMediaSent	-2.417	-1.855	-0.880	-2.126	-1.424	-1.658	-0.868	-2.180
	(-2.47)**	(-2.13)**	(-0.92)	(-1.41)	(-1.32)	(-1.57)	(-0.76)	(-1.46)
UEUpxOwnSent	0.331	2.928	2.333	0.676	0.712	1.954	0.821	0.128
	(0.27)	(2.23)**	(1.75)	(0.40)	(0.54)	(1.81)*	(0.68)	(0.10)
UEDown	4.092	2.613	2.179	2.133	1.312	1.548	1.239	1.744
	(11.21)***	(7.38)***	(7.21)***	(6.59)***	(4.17)***	(4.75)**	(3.71)***	(4.66)***
UEDownxMktSent	6.729	4.852	3.78	3.060	0.404	1.283	0.501	-1.048
	(5.68)***	(3.77)***	(3.47)***	(2.89)***	(0.31)	(1.19)	(0.50)	(-0.85)
UEDownxMediaSent	-0.299	0.525	-0.506	-0.994	0.140	-0.039	0.042	-1.418
	(-0.31)	(0.53)	(-0.58)	(-0.94)	(0.13)	(-0.05)	(0.05)	(-1.37)
UEDownxOwnSent	-0.192	0.906	-1.706	-0.208	0.861	-0.429	-0.618	2.431
	(-0.23)	(0.89)	(-2.11)	(-0.20)	(0.87)	(-0.44)	(-0.57)	(1.95)*
N	9,629	9,629	9,344	9,015	8,883	8,626	8,214	7,889
R^2	0.391	0.443	0.221	0.189	0.254	0.139	0.124	0.144

Panel B: *CFO*

Variable	CFO_{t+1} Coeff. (*t*-stat.)	CFO_{t+2} Coeff. (*t*-stat.)	CFO_{t+3} Coeff. (*t*-stat.)	CFO_{t+4} Coeff. (*t*-stat.)	CFO_{t+5} Coeff. (*t*-stat.)	CFO_{t+6} Coeff. (*t*-stat.)	CFO_{t+7} Coeff. (*t*-stat.)	CFO_{t+8} Coeff. (*t*-stat.)
Intercept	0.008	0.034	0.046	0.041	0.017	0.025	0.061	0.025
	(0.74)	(2.06)**	(2.80)***	(2.45)**	(1.37)	(1.44)	(3.47)***	(1.40)
LagCFO	0.827	-0.264	-0.267	-0.292	0.844	-0.274	-0.264	-0.312
	(72.95)***	(-20.69)***	(-21.20)***	(-22.80)***	(72.68)***	(-20.60)***	(-19.63)***	(-23.07)***
LagEarn	0.015	0.202	0.016	0.023	-0.015	0.150	-0.003	0.018
	(0.82)	(5.89)***	(0.50)	(0.72)	(-0.69)	(4.23)***	(-0.09)	(0.51)
UEUp	0.551	-0.323	-0.254	0.225	-1.110	0.235	-0.002	1.526
	(1.03)	(-0.58)	(-0.49)	(0.36)	(-1.94)	(0.37)	(0.00)	(2.15)**
UEUpxMktSent	-0.341	-2.143	1.650	-0.635	1.203	-3.972	1.094	4.327
	(-0.18)	(-1.08)	(0.89)	(-0.36)	(0.64)	(-1.97)**	(0.49)	(2.18)**
UEUpxMediaSent	-1.442	0.839	-0.087	-2.647	1.608	-0.247	-2.374	-0.589
	(-0.89)	(0.53)	(-0.04)	(-1.52)	(0.96)	(-0.16)	(-1.46)	(-0.33)
UEUpxOwnSent	1.665	0.535	0.707	0.827	-1.184	0.236	0.834	-0.070
	(1.05)	(0.28)	(0.42)	(0.52)	(-0.71)	(0.13)	(0.43)	(-0.04)
UEDown	0.351	0.471	0.319	-0.920	-0.458	0.758	0.398	-0.847
	(0.87)	(1.00)	(0.80)	(-2.58)***	(-1.17)	(1.75)*	(1.00)	(-2.41)**
UEDownxMktSent	2.162	2.872	-1.148	-3.335	1.084	3.708	0.568	-4.459
	(1.66)*	(1.94)*	(-0.85)	(-2.75)***	(0.79)	(2.64)***	(0.54)	(-3.05)
UEDownxMediaSent	-0.548	1.143	0.319	0.804	2.181	-1.768	-0.483	0.246
	(-0.37)	(0.91)	(0.25)	(0.84)	(1.34)	(-1.47)	(-0.43)	(0.02)
UEDownxOwnSent	-1.969	0.370	0.690	-0.713	-2.991	1.527	0.568	-1.002
	(-1.31)	(0.28)	(0.49)	(-0.71)	(-1.89)*	(1.14)	(0.54)	(-0.79)
N	9,629	9,629	9,279	9,003	8,856	8,592	8,178	7,825
R^2	0.391	0.443	0.119	0.107	0.597	0.092	0.079	0.068

Panel A provides the results for equation (3) where the dependent variable is *Earn* which is the 1-8 quarter-ahead earnings per share before extraordinary item. Panel B provides the results for equation (3) where the dependent variable is *CFO* which is the 1-8 quarter-ahead operating cash flows per share. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. *t*-statistics are adjusted for clustering by month.

Variable definitions: In columns 1 and 2, *LagEarn* is actual earnings three quarters behind. In columns 3 and 4, *LagCFO* is operating cash flow three quarters behind. *UE* is the current quarter earnings minus same quarter earnings in the prior year, scaled by stock price at the end of the current quarter. *UEUp* (*UEDown*) is the product of *UE* and an indicator variable that is equal to 1 if *UE* is positive (negative) and 0 otherwise. *MediaSent* is press-initiated firm-specific sentiment, computed as the residual from equation (1) where *Sent_Media* is the dependent variable. *OwnSent* is firm-initiated sentiment, computed as the residual from equation (1) where *Sent_Firm* is the dependent variable. *MktSent* is the monthly Baker-Wurgler Sentiment Index at the start of the current month.

Table 6

Media Sentiment, Future Abnormal Return and Analyst Forecast Errors

	Abnormal return		Analyst forecast errors	
	(1)	(2)	(3)	(4)
Media sentiment deciles	Returns	*t*-stat.	Forecast errors	*t*-stat.
1	0.011	2.35**	-0.069	-1.12
2	0.008	2.16**	-0.083	-1.54
3	0.006	1.78*	-0.136	-1.89*
4	0.013	2.78***	-0.215	-2.25**
5	0.003	1.66*	-0.197	-2.16**
6	0.005	1.77*	-0.109	-2.05**
7	0.009	1.87*	-0.241	-2.77***
8	-0.001	-0.05	-0.279	-3.36***
9	-0.002	-0.73	-0.296	-3.54***
10	-0.009	-2.44**	-0.325	-3.76***
Difference decile 1−decile10	0.021	4.23***	0.256	5.59***

The table provides the results for the cumulative abnormal stock returns in the period +2 to +60 (analyst forecast errors in the period -30 to -1) in columns 1 and 2 (columns 3 and 4). In columns 1 and 2, cumulative abnormal stock return is calculated using125 portfolios returns (size, MTB, and momentum) based on Daniel, Grinblatt, Titman, and Wermers (1997). In columns 3 and 4, analyst forecast errors are constructed as the difference between firms' actual earnings figures and the mean consensus analyst earnings forecast from I/B/E/S, scaled by the absolute value of the consensus EPS forecast following Hribar and McInnis (2012). We sort the entire sample according to the media sentiment values into deciles. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively.

Table 7

Regression Results for Equation (2) for Subsamples Partitioned on Scaled Residual from Equation (1)

	Scaled residual – Low		Scaled residual – High	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
Intercept	0.007	2.41**	0.007	3.38***
Down	-0.011	-3.12***	-0.014	-3.75***
UEUp	0.128	1.78*	0.211	1.69*
UEUpxMktSent	0.025	0.06	0.041	0.09
UEUpxMediaSent	0.274	1.91*	0.103	1.72*
UEUpxOwnSent	0.046	0.53	0.065	0.27
UEDown	0.149	1.86**	0.163	1.69
UEDownxMktSent	0.009	0.00	0.016	0.05
UEDownxMediaSent	-0.289	-1.77*	-0.131	-1.69*
UEDownxOwnSent	-0.072	-0.51	-0.065	-0.34*
NonlUp	0.052	0.03	0.073	0.05
UEUp x *MktPE*	-0.005	-0.58	-0.011	-0.31
NonlDown	-0.195	-1.85*	-0.307	-1.48
UEDown x *MktPE*	0.001	0.13	0.001	0.07
N	4,814		4,815	
R^2	0.040		0.042	

The table provides the results for the second-stage regression model, i.e., equation (2), where the dependent variable is *CAR* which is the cumulative abnormal return for the -1, +1 window around the earnings announcement, for two subsamples based on the scaled residual from equation (1) where the residual is scaled by the raw media sentiment, i.e., *MediaSent*/*Sent_Media*. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. *t*-statistics are adjusted for clustering by month.

Variable definitions: *UE* is the current quarter earnings minus same quarter earnings in the prior year, scaled by stock price at the end of the current quarter. *UEUp* (*UEDown*) is the product of *UE* and an indicator variable that is equal to 1 if *UE* is positive (negative) and 0 otherwise. *MediaSent* is press-initiated firm-specific sentiment, computed as the residual from equation (1) where *Sent_Media* is the dependent variable. *OwnSent* is firm-initiated sentiment, computed as the residual from equation (1) where *Sent_Firm* is the dependent variable. *MktSent* is the monthly Baker-Wurgler Sentiment Index at the start of the current month. *NonlUp* is the square of *UEUp* multiplied by -1. *NonlDown* is the square of *UEDown* multiplied by -1. *MktPE* is the aggregate stock market PE in the prior month minus the mean market PE over the prior 12 months.

Table 8

Regression Results for Equation (2) for Subsamples Partitioned on Uncertainty

Panel A. Sentiment exposure	Not exposed firms		Exposed firms	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
Intercept	0.004	3.61***	0.003	0.65
Down	-0.011	-5.23***	-0.021	-2.71***
UEUp	-0.073	-0.37	0.089	0.30
UEUpxMktSent	0.134	0.48	0.075	1.97**
UEUpxMediaSent	-0.127	-0.66	0.307	2.03**
UEUpxOwnSent	-0.071	-0.16	-0.638	-1.47
UEDown	-0.114	-0.96	0.048	0.15
UEDownxMktSent	-0.332	-1.49	-0.187	-2.14**
UEDownxMediaSent	0.222	1.05	-0.427	-2.26**
UEDownxOwnSent	0.459	2.40**	-0.384	-1.15
NonlUp	0.336	0.33	0.831	0.65
UEUp x *MktPE*	0.016	1.26	-0.119	-1.91*
NonlDown	-1.221	-3.25***	0.191	0.21
UEDown x *MktPE*	0.002	0.50	0.068	0.62
N	1,926		1,915	
R^2	0.030		0.029	
Panel B. Firm size	Large firms		Small firms	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
UEUpxMktSent	-0.243	-0.50	0.060	1.72*
UEUpxMediaSent	-0.491	-1.19	0.425	2.10**
UEUpxOwnSent	-0.293	-0.64	0.989	0.88
UEDownxMktSent	0.313	0.51	-0.103	-2.13**
UEDownxMediaSent	-0.050	-0.14	-0.517	-2.16**
UEDownxOwnSent	0.526	0.87	-0.327	-0.54
N	1,897		1,912	
R^2	0.026		0.025	
Panel C. Firm age	Old firms		Young firms	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
UEUpxMktSent	-0.402	-0.60	0.275	2.47**
UEUpxMediaSent	0.097	0.12	0.538	2.17**
UEUpxOwnSent	1.030	1.23	-0.000	-0.00
UEDownxMktSent	-0.037	-0.10	-0.507	-0.88
UEDownxMediaSent	-0.132	-0.40	-0.610	-2.25**
UEDownxOwnSent	-0.040	-0.07	0.290	0.41
N	1,913		1,941	
R^2	0.044		0.049	

Panel D. Return volatility				
	Low volatility		High volatility	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
UEUpxMktSent	1.366	1.26	0.141	1.75*
UEUpxMediaSent	0.646	0.58	0.304	2.06**
UEUpxOwnSent	1.579	1.03	0.016	0.06
UEDownxMktSent	0.216	0.25	0.028	0.07
UEDownxMediaSent	-1.585	-1.22	-0.660	-3.27***
UEDownxOwnSent	1.646	1.51	-0.188	-0.89
N	1,935		1,916	
R^2	0.036		0.026	
Panel E. Dividends				
	High dividend		No dividends	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
UEUpxMktSent	0.025	0.03	0.111	2.03**
UEUpxMediaSent	0.372	0.52	0.465	2.08**
UEUpxOwnSent	-0.231	-0.32	0.769	0.64
UEDownxMktSent	-0.587	-0.60	-0.455	-0.86
UEDownxMediaSent	-0.460	-0.48	-0.378	-1.91*
UEDownxOwnSent	-0.004	-0.00	-0.331	-0.55
N	1,885		3,437	
R^2	0.017		0.025	
Panel F. Book-to-market ratio				
	Medium BTM		Extreme BTM	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
UEUpxMktSent	-0.105	-0.24	0.071714	1.77*
UEUpxMediaSent	0.074	0.22	0.43009	1.98**
UEUpxOwnSent	0.195	0.39	0.199609	0.54
UEDownxMktSent	-0.030	-0.07	-0.02346	-0.09
UEDownxMediaSent	-0.244	-0.95	-0.35543	-2.32**
UEDownxOwnSent	-0.404	-1.61	-0.20827	-1.18
N	5,798		3,831	
R^2	0.028		0.014	

The table provides the results for the second-stage regression model, i.e., equation (2), where the dependent variable is *CAR* which is the cumulative abnormal return for the -1, +1 window around the earnings announcement, for subsamples based on uncertainty or difficulty of valuing the firm. In panel A, the sample is partitioned based on a composite measure of exposure to sentiment. The composite measure is based on the first principle component from a principle component analysis of the decile ranks of five measures of value uncertainty - firm size, firm age, return volatility, dividends paying status, and extreme growth. Each month firms are ranked based on the composite measure, and firms in the top (bottom) quintile are classified as 'Exposed' ('Not exposed') stocks. In panel B, the sample is partitioned by firm size where 'Large firms' ('Small F=firms') are in the top (bottom) quintile of firms sorted by market capitalization. In panel C, the sample is partitioned based on firm age where 'Old firms' ('Young firms') are in the top (bottom) quintile of firms sorted by the number of months since the firm was included in the CRSP database. In panel D, the sample is partitioned based on stock return volatility where 'Low volatility' ('High volatility') firms are in the bottom (top) quintile of firms sorted by the standard deviation of monthly returns in the past year. In panel E, the sample is partitioned based on dividends where 'High dividends' are firms in the top quintile of dividend paying firms sorted by dividend payout in the most recent year and 'No dividends' are firms that did not paid dividends in the most recent year. In panel F, the sample is partitioned based on the book-to-market ratio where 'Medium BTM' ('Extreme BTM') firms are in the middle three (top and bottom) quintiles of firms

sorted by book-to-market ratio computed for the most recent fiscal year prior to the start of the current year. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. *t*-statistics are adjusted for clustering by month.
Variable definitions: *UE* is the current quarter earnings minus same quarter earnings in the prior year, scaled by stock price at the end of the current quarter. *UEUp* (*UEDown*) is the product of *UE* and an indicator variable that is equal to 1 if *UE* is positive (negative) and 0 otherwise. *MediaSent* is press-initiated firm-specific sentiment, computed as the residual from equation (1) where *Sent_Media* is the dependent variable. *OwnSent* is firm-initiated sentiment, computed as the residual from equation (1) where *Sent_Firm* is the dependent variable. *MktSent* is the monthly Baker-Wurgler Sentiment Index at the start of the current month. *NonlUp* is the square of *UEUp* multiplied by -1. *NonlDown* is the square of *UEDown* multiplied by -1. *MktPE* is the aggregate stock market PE in the prior month minus the mean market PE over the prior 12 months.

Table 9

Analyses of the Interaction between Media Sentiment and Market-wide Investor Sentiment

Panel A. Three-way interaction	Coefficient	*t*-stat.
Intercept	0.007	7.37***
Down	-0.013	-8.91***
UEUp	0.071	0.63
UEUpxMktSent	0.010	0.04
UEUpxMediaSent	0.133	2.16**
UEUpxMediaSentxMktSent	0.164	0.49
UEUpxOwnSent	0.000	0.00
UEDown	0.081	0.95
UEDownxMktSent	0.106	0.48
UEDownxMediaSent	-0.111	-1.80*
UEDownxMediaSentxMktSent	-0.148	-0.81
UEDownxOwnSent	-0.133	-0.66
NonlUp	0.041	0.07
UEUp x *MktPE*	-0.048	-1.41
NonlDown	0.108	0.48
UEDown x *MktPE*	0.060	1.34
N	9,629	
R^2	0.037	

Panel B. Extreme market sentiment	Lowest market sentiment		Highest market sentiment	
	(1) Coefficient	(2) *t*-stat.	(3) Coefficient	(4) *t*-stat.
Intercept	0.007	7.05***	0.006	4.07***
Down	-0.013	-6.83***	-0.013	-5.66***
UEUp	0.378	1.88*	0.134	0.89
UEUpxMktSent	0.908	2.66***	-0.506	-0.85
UEUpxMediaSent	0.206	1.77*	0.253	2.10**
UEUpxOwnSent	-0.058	-0.21	-0.095	-0.23
UEDown	-0.023	-0.14	0.541	2.61**
UEDownxMktSent	0.026	0.06	-0.642	-1.66*
UEDownxMediaSent	-0.423	-2.03**	-0.268	-1.86*
UEDownxOwnSent	-0.037	-0.26	0.491	1.29
NonlUp	-0.552	-0.64	-0.371	-0.40
UEUp x *MktPE*	-0.051	-1.34	-0.043	-1.05
NonlDown	-0.144	-0.43	1.176	1.74*
UEDown x *MktPE*	0.081	1.59	-0.074	-0.76
N	1,926		1,926	
R^2	0.028		0.033	

The table provides the results for second-stage regression models where the dependent variable is *CAR*, which is the cumulative abnormal return for the -1, +1 window around the earnings announcement, for two analyses that examine the interaction of media sentiment and market-wide investor sentiment. In panel A, two three-way interactions are added to equation (2). In panel B, equation (2) is estimated for two subsamples based on extreme market sentiment. The sample is partitioned by market sentiment where 'Highest market sentiment' ('Lowest market sentiment') are in the top (bottom) quintile of firms sorted by *MktSent*. *, **, and *** indicate significance at the 0.10, 0.05, and 0.01 levels, respectively. *t*-statistics are adjusted for clustering by month.

Variable definitions: *UE* is the current quarter earnings minus same quarter earnings in the prior year, scaled by stock price at the end of the current quarter. *UEUp* (*UEDown*) is the product of *UE* and an indicator variable that is

equal to 1 if *UE* is positive (negative) and 0 otherwise. *MediaSent* is press-initiated firm-specific sentiment, computed as the residual from equation (1) where *Sent_Media* is the dependent variable. *OwnSent* is firm-initiated sentiment, computed as the residual from equation (1) where *Sent_Firm* is the dependent variable. *MktSent* is the monthly Baker-Wurgler Sentiment Index at the start of the current month. *NonlUp* is the square of *UEUp* multiplied by -1. *NonlDown* is the square of *UEDown* multiplied by -1. *MktPE* is the aggregate stock market PE in the prior month minus the mean market PE over the prior 12 months.