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The Comovement of Investor Attention

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Abstract. Prior literature has documented that investor attention and constraints on that attention are associated with the pricing of stocks. We introduce the concept of attention comovement, which is the extent to which investor attention to a firm is explained by attention paid to the firm's industry and the market in general. We find that attention comovement is nontrivial for the average firm and is related to firm characteristics, such as size and visibility. We also find that the comovement of investor attention has market consequences, in that it is positively associated with excess stock return comovement. Finally, we show that a firm's earnings announcement contributes to the transfer of attention from one firm to its peer firms. Our results provide insights about the information flows underlying return comovement and aid in understanding the micro and macronature of investor attention.

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1. Introduction

The investor attention literature is based on the idea that attention is a limited resource. That is, because investors cannot pay attention to all stocks or acquire and process all relevant information, they must be selective about the particular stocks they choose to follow (Hirshleifer and Teoh 2003). This literature has largely focused on the *level* of attention that a specific firm receives.[1] We introduce the concept of *attention comovement*, by which we mean the degree to which firm-specific attention is explained by general industry and market attention. If investor attention comoves with the broader level of attention paid to equity markets, or within industries, then capital allocation may similarly comove, which could help to explain the observed excess correlation of stock returns, as documented in previous research (Barberis et al. 2005). Our research objectives are threefold. First, we investigate the extent to which investor attention comoves by developing a novel measure of attention comovement. We then investigate factors explaining attention comovement for a given firm. Finally, we investigate a capital market consequence of attention comovement by examining whether attention comovement helps predict subsequent excess comovement of stock returns.

This study sits at the intersection of two important literatures. The attention literature provides consistent evidence that investor attention (or conversely, inattention) to firm-specific information and events is associated with positive (negative) capital market effects (e.g., Hirshleifer and Teoh 2003, Hirshleifer et al. 2009, Corwin and Coughenour 2008, Chakrabarty and Moulton 2012). The return comovement literature finds that stock returns comove in ways that fundamentals cannot fully explain, which has prompted the investigation of behavioral explanations of excess return comovement (e.g., Barberis et al. 2005).[2] Our objective is to link these two literatures via the concept of attention comovement.[3]

We predict that investor attention will comove for several related reasons. First, attention is likely a social construct (in addition to being an individual construct), as investors and stakeholders communally gather information from each other. Shiller (1989) calls investing a "social activity" in which investors discuss, read, and gossip about investments. Han and Hirshleifer (2015) provide analytical support for the notion that social processes can affect financial outcomes. Hirshleifer and Teoh (2009) and Hirshleifer (2015) argue that the next frontier of behavioral finance is social finance, in which investor learning is at least partially socially driven. The same arguments hold for investor attention. As a result of social forces and interactions, investors will collectively focus on similar firms and their correlated information flows (i.e., attention will comove).

Our second rationale to explain attention comovement stems from a noise trader model, such as that in Barberis et al. (2005), in which different investor groups focus on "categories" of stocks, which in turn leads

to sentiment-based return comovement. Investor attention will comove as investor groups systematically seek out information for similar categorical stocks or as they experience correlated shocks to the demand for information. We examine attention comovement for an intuitive category, industry, which is a common approach in the comovement literature. All else equal, we would expect that firms in the same industry would have fundamentals and attention that move together.

To develop a measure of attention comovement, we follow a methodology similar to that of the return comovement literature to identify the amount of attention a firm receives that is explained by industry and marketwide attention. Specifically, we regress each of our attention proxies (discussed below) on measures of industry and market attention, which are created by aggregating firm-level measures within industries and across the market. We then use the R^2 from these annual, firm-specific regressions as a measure of attention comovement—the greater the amount of firm-level attention that is explained by industry and market attention (i.e., higher R^2), the lower the amount of firm-specific attention paid to the stock. These measures capture the comovement in firm attention with industry and market attention.

We employ a set of four measures of the amount of attention paid to a particular firm: (1) analyst forecast revisions, (2) EDGAR downloads, (3) business press articles, and (4) Google searches for the firm's stock ticker. We also compile a composite score of all four measures using factor analysis and label the resulting factor "A-Score," which is an abbreviation for attention score. These measures of attention have several advantages. First, the measures capture market participants' actions to acquire or produce financial information. Thus, we can measure a specific form of information-related attention—attention to financial information. This is important because while prior research likely *assumes* that information flows underlie excess returns comovement, our measures directly capture correlated information flows. Second, the measures capture a spectrum of users ranging from highly sophisticated financial analysts to less sophisticated Google users. This spectrum allows us to examine how the determinants and consequences of attention comovement vary by level of user sophistication. Third, the measures represent clear actions on the part of market participants—for example, an investor who seeks the 10-K for a particular firm is very likely paying attention to that firm. As discussed above, we use these measures of the level of market attention to in turn create firm-year-specific measures of attention comovement, which is the primary test variable in this study.

We conduct our analyses using a broad cross section of 6,051 firm-year observations from the 2007–2011 period. We first provide evidence on the importance of industry/market attention: we find that the average R^2 from these regressions is 18.3%, ranging from 10.3% for Google Internet searches to 26.4% for EDGAR financial filing searches. These numbers reveal that a fair portion of the variation in firm-specific attention is explained by variation in industry/market attention. In other words, some of the attention paid to a firm by investors, analysts, and the business press is associated with attention paid to the firm's industry or the market in general.[4] An implication of this result is that inferences in prior research focusing on firm-specific attention are likely to be explained, in part, by industry/market attention. In other words, some microlevel attention results from investor attention to the macro level. This finding also reveals an interesting pattern in how investor sophistication relates to attention comovement—we find that attention from more sophisticated market participants (e.g., EDGAR users) comoves to a greater degree than that from less sophisticated market participants.

Next, we examine factors that are related to the composite measure of attention comovement. After controlling for the influence of fundamentals comovement, we find that attention comovement is higher for larger and more visible firms. This finding suggests that when investors are paying attention to a particular industry or the market as a whole, they also concentrate on the larger, more visible firms within industries and the market. For example, when investor attention moves to tech stocks in general, it likely also falls on the prominent players in the tech industry, such as Apple or Microsoft. Overall, the implication of these findings is that attention comoves in excess of what is explained by comovement in firm fundamentals, and this excess comovement of attention is associated with firm characteristics.

Having identified factors that are associated with cross-sectional variation in attention comovement, we next examine a potential capital market outcome of attention comovement, namely, excess return comovement. The notion that the returns of related assets move in tandem is a fundamental concept in asset pricing theory. Theoretically, in a well-functioning, frictionless market, the comovement of asset prices should be tightly linked to comovement in asset fundamentals. However, recent research documents that return comovement cannot be fully explained by comovement in fundamentals (e.g., Barberis et al. 2005). Subsequent research focuses on similarities in *firm characteristics*. These studies tend to identify categories within which prices, which are the outcome of information acquisition and trading activities, comove.[5] However, prior research focuses on the outcome (excess return comovement) without necessarily examining the information flows leading to that outcome.[6]

Our attention comovement measure quantifies the correlated actions of investors and information intermediaries to gather and supply information about

firms and, therefore, allows us to potentially speak to the information mechanisms that can influence excess return comovement. The concept of categorical comovement has been proposed in prior research (Barberis et al. 2005, Morck et al. 2000), but our operationalization and quantification of *categorical attention*—i.e., the notion that attention covaries for industry-related firms—is novel to the literature. In our paper, we focus on the category of industry.[7] A firm's industry is perhaps the most natural category for attention comovement, as shocks to an industry (such as regulatory changes, labor events, and litigation) reverberate through all firms in the industry, which will lead to correlated attention across industry-related firms.

We find that attention comovement is positively related to contemporaneous comovement in equity returns. In other words, when the extent to which market participants pay attention to a stock is strongly associated with the level of industry/market attention, the stock's returns are also strongly linked to industry/market returns. This effect holds after controlling for firm size and visibility (Chan and Hameed 2006 and Brandt et al. 2010), as well as S&P 500 membership (Barberis et al. 2005) and nominal price levels (Green and Hwang 2009). Thus, we provide a novel explanation for excess returns comovement that is incrementally predictive beyond prior explanations.

We also examine the lead-lag relation between attention comovement and excess return comovement. We find that lagged attention comovement predicts current excess return comovement and that lagged return comovement predicts current attention comovement. While this finding suggests that the two concepts are jointly determined, it does not diminish the importance of the finding that attention comovement can significantly affect future excess return comovement. The implication of this finding is that the correlated attention of investors and other market participants can affect excess comovement in asset prices, an explanation of return comovement that is new to the literature.

We perform several additional analyses to support this primary finding and to shed some light on the ways that attention comovement can influence excess return comovement. First, we find that the association of attention comovement with return comovement depends on the market participant's level of sophistication (for example, Google-based attention comovement is less related to return comovement than is analyst-based attention comovement). This finding suggests that the correlated attention of sophisticated market participants has a greater impact on return comovement than that of less sophisticated market participants.

Second, we examine how attention transfers between related firms for two corporate events: peer-firm earnings announcements and 52-week highs/lows. The former event is related to fundamental information, whereas the latter is not related to fundamentals.[8] We find that peer firm earnings announcements trigger significant increases in the level of investor attention, consistent with the notion of attention transfer from the announcing peer firm to the nonannouncing peer firm.[9] We find that this effect is stronger for firms whose attention comoves more with the industry and market, which suggests that attention transfers are stronger for firms whose attention is more closely tied to industry/market attention. Thus, an information event that increases attention for an announcing firm also increases attention across the industry; i.e., attention moves from the micro level to the macro level. We find the opposite for the 52-week high/low—namely, that attention paid to one firm is unaffected or even decreased when a peer firm's stock price reaches a 52-week high or low. Taken together, the results for these two events suggest that attention appears to transfer more for information-related events (earnings announcements) than for non-information-related events (52-week highs and lows). Intuitively, this result suggests that when a peer firm has an information event, it draws attention to non-event peer firms; when a peer firm has a non-information event, it actually draws attention away from the non-event peer firms. We interpret these results to suggest that information flows underlie attention comovement.

In summary, our paper contributes to the literature by introducing the novel concept of attention comovement, examining its determinants, and demonstrating its impact on capital markets. In the past few years, researchers have uncovered the importance of the *level* of attention for explaining capital market phenomena—however, by showing that a substantial portion of the level of firm attention is driven by industry/market attention, this study concludes that the notion of attention is more nuanced and complex than portrayed in prior research. In other words, attention is not just a firm-level construct—it is an industry- and market-level construct as well. An important implication of our findings is that if we control for the amount of attention, the more a firm's attention comoves, the less firm-specific attention that firm may actually receive.

This study also contributes to the literature on return comovement, which has broadly demonstrated the anomalous finding that stock returns comove excessively. As Hirshleifer (2015) advocates a move from behavioral finance to "social finance," this paper answers the call to better understand how attention is partly a social process that can affect financial outcomes. Prior research provides evidence to support multiple explanations for return comovement, including behavioral, risk-based, and informational explanations. Our study helps advance this literature

by providing evidence of a previously unconsidered social and informational explanation for excessive return comovement: that investor attention also tends to comove as investors collectively focus on similar firms and their correlated information flows. Thus, we document that as the collective eyes of the market move in tandem, so too do the returns of the stocks they pay attention to.

2. Data, Variables, and Sample

2.1. Measures of Attention

Our analysis requires measures of investor attention to compute attention comovement. To capture investor attention, we employ four state-of-the-art measures that have been used in prior research: Internet search volume, analyst forecast revisions, the count of business press mentions for a particular firm, and the number of EDGAR downloads of a firm's financial statements. To calculate Internet search volume, we obtain a proprietary database of investors' weekly search activities made available by Google through the Google Trends application.[10] Google Trends tracks and reports the search volume index (SVI), which is a relative measure of user searches for a particular term on the Google search engine.[11] Following Da et al. (2011) and Drake et al. (2012), we use ticker symbols as the search term for the firms, which makes it more likely that the user is searching for financial information rather than for nonfinancial information.[12] To control for the normal level of search volume in a firm, we remove from the weekly SVI the median SVI over the past eight weeks, following Da et al. (2011), and scale by the median SVI for the past eight weeks plus 1. Thus, $Google_{i,w}$ measures the abnormal level of Internet searches during the week for a particular firm.

Our second measure of attention, $AnalystFor_{i,w}$, is equal to the count of earnings forecast revisions made by sell-side analysts for a given firm-week from the Institutional Brokers' Estimate System (I/B/E/S) detail file. Following Frankel et al. (2006), we count the number of unique earnings per share revisions issued for each firm-week, including forecasts for all time horizons (i.e., one-year, two-year, and all other horizons).[13]

The third measure of attention is media coverage, $Media_{i,w}$, which is equal to the number of articles issued by the business press for each firm-week.[14] We obtain business press data from RavenPack, which provides data on business press coverage through the Dow Jones News Archives and *Wall Street Journal* (e.g., Drake et al. 2014). While the data obtained from RavenPack do not include coverage from all press outlets, the large circulation of these two outlets makes them well suited to investigate the market effects of the business press (Tetlock 2007).

Our fourth proxy for investor attention, $Edgar_{i,w}$, is the number of EDGAR downloads for a given firm's 10-K or 10-Q statements during a given week. EDGAR is the U.S. Securities and Exchange Commission's (SEC's) online repository for all SEC-mandated filings, among which are the 10-K (annual report) and 10-Q (quarterly report). Drake et al. (2015) report that the 10-K and 10-Q reports are among the most frequently downloaded SEC filings. Therefore, we use the $Edgar_{i,w}$ variable as a proxy for investor attention to financial statements.

2.2. Measures of Comovement

Our first objective is to examine the extent to which attention is an industry and marketwide phenomenon. To achieve this objective, we employ a methodology similar to that used in the return comovement literature, which regresses individual firm stock returns on industry and market returns and, in turn, employs the explained variation (R^2) as a measure of return comovement (e.g., Morck et al. 2000). We perform a similar calculation with each of our attention measures, where, for each 52-week period prior to the fiscal year-end for a given firm, we estimate the following regression for each firm-year:

$$FirmAttention_{i,w} = \beta_0 + \beta_1 IndustryAttention_w + \beta_2 MarketAttention_w + \varepsilon_{i,w}, \quad (1)$$

where i indexes firms and w indexes weeks. *FirmAttention* is one of the four measures of attention described above: *Google*, *AnalystFor*, *Media*, or *Edgar*. For each of these four measures of attention, we also create an industry-level measure of attention, *IndustryAttention*, by computing the equal-weighted attention for the industry, defined by the two-digit Standard Industrial Classification (SIC) code, for a given week (excluding firm i). We also create a market-level measure of attention, *MarketAttention*, for each of the four attention variables by computing the equal-weighted total attention for all sample firms in a given week (excluding firm i). We estimate Equation (1) for each firm and fiscal period, requiring at least 45 weekly observations.

Using an approach similar to that of Morck et al. (2000), we obtain an estimate of attention comovement by taking the log transformation of the R^2, as follows:

$$ComoveAttention_{i,t} = \log(R^2/(1-R^2)), \quad (2)$$

where R^2 is the coefficient of determination from the firm-year estimation of Equation (1).[15] Using this approach, we compute a "comove" variable for each of the four attention variables—*ComoveGoogle*, *ComoveAnalyst*, *ComoveMedia*, and *ComoveEdgar*. By constructing the comovement measure in this way, we can interpret increases in *ComoveAttention* as indicating that a given

firm's attention is more closely tied to industry and market attention.[16]

An advantage of using these four various measures of attention and attention comovement is that they capture different types of attention from different types of market participants. First, all measures capture some form of information diffusion, in the form of either information production (e.g., analysts, media) or information acquisition (e.g., EDGAR, Google). This allows us to speak to attention that is related to information, which is important in understanding how attention comovement relates to return comovement. While prior research *assumes* that information flows underlie excess return comovement, with these measures, we can examine information flows as captured by attention comovement. Second, the different measures capture a spectrum of user sophistication, ranging from the attention of highly sophisticated financial analysts to that of less sophisticated Google users. This allows us to speak to whether the type of market participant (i.e., high versus low sophistication) exhibits higher or lower attention comovement.

Once we calculate each of the attention comovement measures, we create a composite attention comovement measure ($ComoveA\text{-}Score_{i,t}$). To do so, we conduct a factor analysis with our four attention comovement variables and retain the principal factor.[17] In our subsequent analyses, we focus primarily on the results using $ComoveA\text{-}Score_{i,t}$ because we believe that it best captures the general construct of attention comovement.

We compute return comovement measures using a similar methodology. We follow Piotroski and Roulstone (2004) and compute $ComoveRet_{i,t}$ using the R^2 from the following regression calculated for each fiscal year-end using the previous 52 weeks of data:

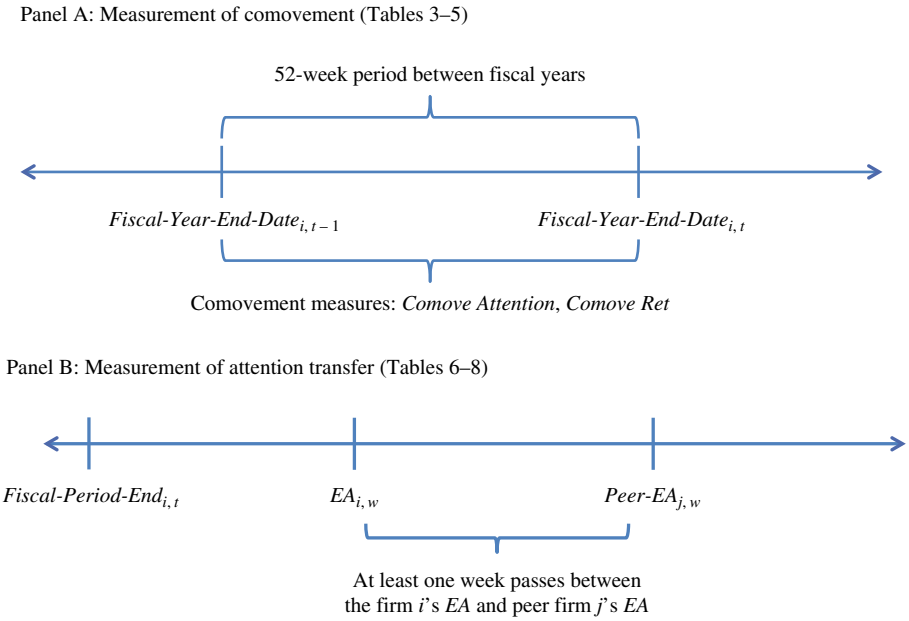
$$Ret_{i,w} = \omega + \omega_1 IndRet_{i,w} + \omega_2 MarketRet_{i,w} + \varepsilon_{i,w}, \quad (3)$$

where $Ret_{i,w}$ is the weekly return for firm i in week w, $IndRet_{i,w}$ is the equal-weighed industry return (two-digit SIC code) in week w (excluding firm i), and $MarketRet_{i,w}$ is the equal-weighted market return for week w (excluding firm i). As we did with the attention comovement variables, we estimate Equation (3) for each firm and fiscal period, requiring at least 45 weekly observations. To obtain an estimate of return comovement, we take the log transformation of the R^2, similar to the approach in Morck et al. (2000):

$$ComoveRet_{i,t} = \log(R^2/(1-R^2)). \quad (4)$$

Figure 1, panel A provides a visual portrayal of the measurement of all comovement variables. In the prior

Figure 1. (Color online) Timeline and Variable Measurement



Notes. In panel A, both comovement variables (*ComoveAttention*, *ComoveRet*) are derived from an annual, firm-specific regression of the firm-level variable on the industry and market variables (both excluding firm i). We then log transform the R^2 from that regression to arrive at the firm-year measure of attention or returns comovement. For example, to measure attention comovement, *ComoveAttention*, we estimate in Equation (1) the regression for each firm i and year t, where attention is measured at the firm, two-digit industry, and equal-weighted market levels. We obtain the R^2 from this regression, and because the R^2 is bounded at 0 and 1, we take the log transformation to compute *ComoveAttention* for firm i and year t (see Equation (2)). In panel B, in the tests of attention transfer for earnings announcements, we employ a pooled regression in which all firm-week observations of investor attention are included. Specifically, we regress the level of investor attention for firm i and week w, $Attention_{1,w}$; an indicator for the week firm i announces earnings, $EA_{i,w}$; and an indicator for the week a related firm j announces earnings, $PeerEA_{j,w}$. To clearly distinguish peer firm effects, we exclude observations when both firm i and firm j release earnings during the same week. Control variables are included for firm i and are measured as of the end of the fiscal period.

literature, $ComoveRet_{i,t}$ is often interpreted as a measure of how much firm-specific information is incorporated into a firm's stock price: firms with high (low) $ComoveRet_{i,t}$ have lower (greater) amounts of firm-specific information in price relative to industry- and market-related information.

2.3. Data and Descriptive Statistics

We obtain data from seven different databases, including Compustat (financial data), Center for Research in Security Prices (market data), I/B/E/S (analyst data), Thomson Reuters (institutional ownership data), RavenPack (business press data), Google Trends (Google search data), and EDGAR (SEC search data). The intersection of these data sets results in 6,051 firm-year observations from 2007 to 2011. Our sample is constrained to this time period because of the availability of EDGAR and Google search data. For selected analyses conducted at the firm-week level, these databases yield a sample of 239,400 firm-week observations.

Table 1, panel A reports the descriptive statistics for all variables used to investigate the comovement of investor attention, which are measured at the firm-year level. Across the four attention measures, attention via EDGAR exhibits the highest average comovement (mean *Edgar-R*^{2} = 26.4% and mean $ComoveEdgar_{i,t}$ = −1.323),

Table 1. Descriptive Statistics

Variable	Mean	SD	25th percentile	50th percentile	75th percentile
Panel A—Attention comovement (firm-year)					
$ComoveA\text{-}Score_{i,t}$	−0.023	0.964	−0.624	0.147	0.678
$ComoveGoogle_{i,t}$	−2.740	1.372	−3.515	−2.552	−1.749
$ComoveAnalyst_{i,t}$	−1.651	1.279	−2.393	−1.368	−0.735
$ComoveMedia_{i,t}$	−2.246	1.303	−2.999	−2.054	−1.365
$ComoveEdgar_{i,t}$	−1.323	1.209	−1.943	−1.135	−0.501
$Google\ R^2_{i,t}$	0.103	0.096	0.029	0.072	0.148
$Analyst\ R^2_{i,t}$	0.219	0.154	0.084	0.203	0.324
$Media\ R^2_{i,t}$	0.145	0.127	0.047	0.114	0.203
$Edgar\ R^2_{i,t}$	0.264	0.171	0.125	0.243	0.377
$ComoveRet_{i,t}$	−0.419	1.087	−0.995	−0.277	0.347
$ROA_{i,t}$	0.031	0.122	0.006	0.041	0.087
$MktVal_{i,t}$	5,628	14,028	364	1,262	3,894
$Bk/Mkt_{i,t}$	0.658	0.533	0.320	0.545	0.850
$SalesGrowth_{i,t}$	1.074	0.252	0.956	1.054	1.153
$Inst_{i,t}$	0.729	0.226	0.599	0.786	0.904
$\#Analysts_{i,t}$	8.695	6.900	3.000	7.000	13.000
$StdROA_{i,t}$	0.064	0.089	0.015	0.033	0.075
$Abs(Ret_{i,t})$	0.365	0.377	0.121	0.262	0.485
$StkTurn_{i,t}$	0.029	0.021	0.015	0.023	0.036
$ComoveEarn_{i,t}$	−3.248	2.283	−4.449	−2.942	−1.697
$SP500_{i,t}$	0.245	0.430	0.000	0.000	0.000
$Price_{i,t}$	27.578	22.502	10.400	22.540	38.515
Panel B—Attention levels (firm-week)					
$A\text{-}Score_{i,w}$	−0.002	0.987	−0.734	−0.136	0.611
$Google_{i,w}$	0.024	0.242	−0.067	0.000	0.067
$AnalystFor_{i,w}$	1.077	2.014	0.000	0.000	1.000
$Media_{i,w}$	17.215	33.846	2.000	6.000	17.000
$Edgar_{i,w}$	86.359	96.672	31.000	56.000	103.000
$EA_{i,w}$	0.019	0.138	0.000	0.000	0.000
$PeerEA_{i,w}$	0.357	0.479	0.000	0.000	1.000
$MktVal_{i,q}$	6,964	16,382	654	1,829	5,095
$Bk/Mkt_{i,q}$	0.589	0.453	0.295	0.491	0.767
$SalesGrowth_{i,q}$	1.090	0.286	0.957	1.061	1.174
$ROA_{i,q}$	0.012	0.032	0.002	0.012	0.025
$Inst_{i,q}$	0.778	0.191	0.675	0.819	0.927
$Uncertainty_{i,q}$	0.130	0.540	0.002	0.010	0.042
$Comp_{i,q}$	0.772	0.192	0.703	0.825	0.906
$MOM_{i,q}$	0.023	0.230	−0.109	0.018	0.137

Notes. Panel A includes the descriptive statistics for the 6,051 firm-year observations that are included in the attention comovement sample used in Tables 3–5. Panel B includes descriptive statistics for the 239,400 firm-week observations that are included in the attention-level sample used in Tables 6–8. All variables are defined in the appendix. All continuous variables are winsorized at the 1st and 99th percentiles.

followed by the comovement of analyst forecast revisions (mean *Analyst* R^2 = 21.9% and mean $ComoveAnalyst_{i,t}$ = −1.651), business press mentions (mean *Media* R^2 = 14.5% and mean $ComoveMedia_{i,t}$ = −2.246), and Internet searches (mean *Google* R^2 = 10.3% and mean $ComoveGoogle_{i,t}$ = −2.740). Two points are worth discussion. First, the average raw R^2 across the four measures is 18.3%, which implies that nearly a fifth of the variation in firm-specific attention can be explained by industry/market attention. Second, the raw R^2 appears to be higher for more sophisticated market participants: EDGAR users and analysts exhibit the highest R^2, while the media and Google users exhibit the lowest R^2.

We also make note of important sample firm characteristics. The median firm in our sample is relatively large, with a market capitalization of $1.3 billion; one-fourth of our sample firms are members of the S&P 500. The majority of firms are profitable (the 25th percentile for *ROA* is above zero). The median firm has a book-to-market ratio of 0.545 ($Bk/Mkt_{i,t}$), annual sales growth of 5.4% ($SalesGrowth_{i,t}$), an institutional ownership percentage of approximately 79% ($Inst_{i,t}$), and analyst coverage of about seven sell-side analysts ($\#Analysts_{i,t}$). Because the sample requires data from the various sources discussed above, and because these sources tend to cover larger firms, the average firm in our sample is likely larger than the average firm in the economy. Thus, the results presented next are best generalized to large firms, and we urge caution in interpreting these results for other, smaller firms.

Table 2 presents pairwise correlations among the variables measured annually (panel A) and measured weekly (panel B). The table shows that *ComoveEdgar*, *ComoveAnalyst*, and *ComoveMedia* are highly correlated with each other, with correlation coefficients ranging from 29% to 43%. *ComoveGoogle* is not highly correlated with the other comovement variables. With the exception of *ComoveGoogle*, each of the individual attention comovement measures is strongly positively associated with the composite attention comovement score, *ComoveA-Score*, indicating a common attention factor among the variables.[18]

3. Attention Comovement

3.1. The Determinants of Attention Comovement

We now turn to examining the determinants of attention comovement. The objective of these analyses is to better understand why investors give individual attention to some firms while viewing other firms primarily as members of an industry or market. We do this by regressing attention comovement on comovement in earnings and other firm characteristics. The regression is specified as follows:

$$\begin{aligned} ComoveAttention_{i,t} &= \delta_{YEAR} + \delta_1 ROA_{i,t} + \delta_2 MktVal_{i,t} + \delta_3 Bk/Mkt_{i,t} \\ &+ \delta_4 SalesGrowth_{i,t} + \delta_5 Inst_{i,t} + \delta_6 \#Analysts_{i,t} \\ &+ \delta_7 StdROA_{i,t} + \delta_8 Abs(Ret_{i,t}) + \delta_9 StkTurn_{i,t} \\ &+ \delta_{10} ComoveEarn_{i,t} + \delta_{11} SP500_{i,t} \\ &+ \delta_{12} Price_{i,t}, + \varepsilon_{i,t}, \end{aligned} \quad (5)$$

where *ComoveAttention* is one of five variables—$ComoveA\text{-}Score_{i,t}$, $ComoveGoogle_{i,t}$, $ComoveAnalyst_{i,t}$, $ComoveMedia_{i,t}$, and $ComoveEdgar_{i,t}$—as defined above, and all independent variables are defined as in the appendix. The unit of observation is the firm-year, which captures the general association between time-variant firm characteristics and attention comovement. In all specifications, we include year fixed effects to account for macroeconomic differences.[19] We assess statistical significance using standard errors clustered by firm.[20]

We emphasize that attention comovement is a new construct; thus, our analysis in this section is exploratory in nature. That being said, we do offer the following predictions with respect to selected firm characteristics. First, we expect attention comovement to be positively associated with comovement in earnings, *ComoveEarn*, which measures the comovement of a firm's return on assets with its industry's return on assets. Similarly, we predict that firms whose fundamentals are more volatile will receive attention that is more volatile, which suggests lower attention comovement with the industry and market. Thus, we expect a negative association between attention comovement and *StdROA*, which is the standard deviation in the firm's return on assets (ROA) over the past five years.

Second, investors prefer to invest in securities with which they are familiar (Merton 1987, Lehavy and Sloan 2008). This intuition, together with the fact that attention is a limited resource (Hirshleifer and Teoh 2003), suggests that investors are more likely to pay attention to larger, "household name" stocks. Consistent with this intuition, prior research finds that larger, more visible stocks are positively associated with Google searches (Drake et al. 2012), analyst following (Bhushan 1989), business press coverage (Bushee et al. 2010), and EDGAR requests (Drake et al. 2015). Thus, we predict that large, visible stocks will also receive even greater levels of investor attention when the industry/market receives attention. For example, investors who allocate attention to "tech" stocks in general will also likely allocate attention to Apple, because Apple is such a visible, important player in the industry and in the market as a whole. This is an example of what we mean by attention comovement. On the other hand, attention paid to a less prominent, small cap stock is likely related to something unique about the particular firm and not to the industry in general. Thus, in model (5), we expect a positive coefficient on variables that capture elements of firm size and visibility,

Table 2. Correlations

Panel A—Attention comovement sample (firm-year)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	$ComoveA\text{-}Score_{i,t}$	1.000	0.013	0.805	0.789	0.653	0.317	0.114	0.215	−0.031	−0.019	0.187	0.350	−0.150	−0.054	0.123	0.024	0.292	0.202
2	$ComoveGoogle_{i,t}$	0.015	1.000	0.003	0.012	0.024	0.007	0.041	0.020	0.005	−0.022	−0.001	0.003	−0.026	−0.010	−0.028	−0.008	0.040	0.004
3	$ComoveAnalyst_{i,t}$	0.796	−0.001	1.000	0.412	0.353	0.253	0.077	0.108	−0.017	−0.010	0.165	0.263	−0.120	−0.052	0.095	0.034	0.183	0.151
4	$ComoveMedia_{i,t}$	0.786	0.009	0.432	1.000	0.291	0.225	0.118	0.143	−0.030	−0.002	0.128	0.216	−0.125	−0.069	0.052	0.014	0.182	0.145
5	$ComoveEdgar_{i,t}$	0.628	0.026	0.338	0.292	1.000	0.242	0.051	0.271	−0.022	−0.037	0.128	0.344	−0.085	0.017	0.153	0.006	0.333	0.166
6	$ComoveRet_{i,t}$	0.329	0.012	0.265	0.242	0.248	1.000	0.126	0.093	0.026	−0.049	0.244	0.255	−0.205	−0.118	0.150	0.050	0.186	0.173
7	$ROA_{i,t}$	0.061	0.025	0.024	0.084	0.031	0.013	1.000	0.171	−0.210	0.139	0.261	0.246	−0.331	−0.127	0.011	0.053	0.182	0.402
8	$MktVal_{i,t}$	0.419	0.021	0.300	0.292	0.401	0.370	0.388	1.000	−0.143	0.033	0.018	0.501	−0.128	−0.093	−0.011	0.000	0.541	0.359
9	$Bk/Mkt_{i,t}$	−0.028	0.008	−0.013	−0.029	−0.035	0.114	−0.446	−0.349	1.000	−0.161	−0.182	−0.237	−0.095	0.038	−0.017	0.068	−0.142	−0.351
10	$SalesGrowth_{i,t}$	−0.001	−0.017	0.008	0.018	−0.038	−0.038	0.358	0.136	−0.257	1.000	0.028	0.074	0.127	−0.008	0.084	0.007	−0.025	0.120
11	$Inst_{i,t}$	0.140	0.004	0.123	0.104	0.085	0.134	0.220	0.327	−0.141	0.100	1.000	0.335	−0.160	−0.042	0.345	0.007	0.154	0.289
12	$\#Analysts_{i,t}$	0.401	0.009	0.327	0.253	0.369	0.301	0.297	0.766	−0.288	0.151	0.372	1.000	−0.137	−0.095	0.345	0.032	0.601	0.392
13	$StdROA_{i,t}$	−0.153	−0.029	−0.148	−0.106	−0.113	−0.192	−0.124	−0.312	−0.118	0.038	0.010	−0.141	1.000	0.199	0.155	−0.060	−0.172	−0.278
14	$Abs(Ret_{i,t})$	−0.045	0.004	−0.063	−0.052	0.022	−0.058	−0.120	−0.159	0.033	−0.043	0.008	−0.089	0.254	1.000	0.192	−0.015	−0.105	−0.107
15	$StkTurn_{i,t}$	0.178	−0.017	0.126	0.097	0.205	0.190	0.094	0.340	−0.118	0.065	0.485	0.484	0.219	0.181	1.000	0.040	0.149	0.029
16	$ComoveEarn_{i,t}$	0.028	−0.007	0.042	0.017	0.012	0.060	0.042	0.016	0.052	0.012	0.016	0.035	−0.087	−0.014	0.051	1.000	0.025	−0.003
17	$SP500_{i,t}$	0.308	0.046	0.200	0.190	0.360	0.182	0.211	0.699	−0.181	−0.002	0.094	0.570	−0.196	−0.087	0.209	0.021	1.000	0.348
18	$Price_{i,t}$	0.245	0.005	0.194	0.186	0.194	0.226	0.524	0.693	−0.374	0.224	0.327	0.458	−0.394	−0.200	0.113	0.015	0.353	1.000

Panel B—Attention transfer sample (firm-week)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	$A\text{-}Score_{i,w}$	1.000	0.023	0.635	0.640	0.710	0.234	0.024	0.524	−0.065	−0.016	0.088	0.081	0.009	−0.042	0.010
2	$Google_{i,w}$	0.039	1.000	0.029	0.011	−0.011	0.017	0.022	−0.014	−0.008	0.016	−0.007	−0.001	−0.005	0.008	−0.010
3	$AnalystFor_{i,w}$	0.655	0.031	1.000	0.315	0.268	0.455	−0.028	0.206	−0.010	0.003	0.040	0.047	0.003	0.013	−0.005
4	$Media_{i,w}$	0.831	0.019	0.365	1.000	0.582	0.123	0.019	0.683	−0.035	−0.014	0.063	−0.061	0.018	−0.018	−0.010
5	$Edgar_{i,w}$	0.793	0.001	0.311	0.506	1.000	0.058	0.029	0.637	−0.057	−0.030	0.079	−0.010	0.007	−0.095	0.014
6	$EA_{i,w}$	0.194	0.022	0.242	0.169	0.065	1.000	−0.105	0.005	−0.020	−0.008	0.009	0.013	−0.001	−0.110	0.004
7	$PeerEA_{i,w}$	0.029	0.010	−0.008	0.043	0.021	−0.105	1.000	0.007	−0.017	0.023	−0.017	−0.009	0.000	0.240	−0.011
8	$MktVal_{i,q}$	0.633	−0.005	0.322	0.564	0.563	0.001	−0.030	1.000	−0.135	0.023	0.140	−0.090	−0.037	−0.053	0.023
9	$Bk/Mkt_{i,q}$	−0.106	−0.001	−0.013	−0.129	−0.079	−0.021	−0.028	−0.312	1.000	−0.196	−0.285	−0.123	0.218	0.113	−0.222
10	$SalesGrowth_{i,q}$	−0.004	0.006	0.007	0.020	−0.043	−0.006	0.026	0.114	−0.293	1.000	0.204	0.022	−0.069	0.007	0.108
11	$ROA_{i,q}$	0.090	0.002	0.040	0.078	0.078	0.016	−0.018	0.312	−0.475	0.355	1.000	0.142	−0.197	−0.064	0.137
12	$Inst_{i,q}$	0.050	0.005	0.031	−0.006	0.059	0.011	0.001	0.077	−0.090	0.077	0.137	1.000	−0.058	−0.093	0.034
13	$Uncertainty_{i,q}$	−0.017	−0.007	0.016	−0.047	0.003	0.000	−0.020	−0.229	0.297	−0.135	−0.341	−0.062	1.000	0.032	−0.048
14	$Comp_{i,q}$	−0.013	−0.003	0.075	−0.006	−0.080	−0.108	0.245	−0.021	0.168	−0.031	−0.178	−0.131	0.077	1.000	−0.015
15	$MOM_{i,q}$	0.026	−0.013	−0.003	0.015	0.037	0.006	−0.012	0.123	−0.208	0.143	0.158	0.037	−0.048	−0.027	1.000

Notes. Pearson correlations are presented above (below) the diagonal. Panel A includes the correlations for the firm-year attention comovement variables used in Tables 3–5. Panel B includes correlations for the firm-week attention transfer variables used in Tables 6–8. All variables are defined in the appendix.

such as *MktVal*, *SalesGrowth*, *Abs*(*Ret*), *ROA*, *#Analysts*, *SP*500, and *StkTurn*, all of which are as defined in the appendix.

Third, we include variables shown in prior research to capture categories within which stock returns appear to comove excessively, beyond the category we focus on: industry. For example, Barberis et al. (2005) show that firms in the S&P 500 index have returns that comove with other index members regardless of their industry affiliation. We also include $Price_{i,t}$ in the regression because Green and Hwang (2009) find that firms' stock returns comove with those of other firms with similar prices.

In summary, we include multiple variables to capture comovement in fundamentals, firm size and visibility, and possible categories of comovement outside of industry membership. Table 3, panel A presents the results of estimating Equation (5), in which the dependent variable is the composite attention comovement score, *ComoveA-Score*. Column 1 (column 2) omits (includes) year fixed effects; clustering is at the firm level in both columns. We find that the explanatory power of the model is 19.7% in column 1 and 20% in column 2; thus, approximately one-fifth of the variation in attention comovement is explained by variation in firm characteristics.[21]

The variation in attention comovement seems to be driven by firm fundamentals. We find that attention comovement is positively associated with the firm's market value (*MktVal*) and book-to-market ratio (*Bk/Mkt*), indicating that large, value firms receive attention that is more likely to comove with industry and market attention. We also find that attention comovement is positively associated with some measures of visibility, such as ln(*#Analysts*). In univariate correlations (see Table 2), we find that *SP*500, *ComoveEarn*, and *Price* are significantly correlated with attention comovement in the expected direction. However, in our multivariate regressions, we do not find evidence that these variables are related to attention comovement. Finally, attention comovement is likely related to macroeconomic trends—however, the introduction of year fixed effects between the two columns in panel A of Table 3 shows that they add very little explanatory power for attention comovement.

In Table 3 panel B, we present regression results using the individual components of attention comovement as dependent variables (i.e., *ComoveAnalyst*, *ComoveEdgar*, *ComoveMedia*, and *ComoveGoogle*). By examining these components separately, we can speak to how different types of information and different market participants affect attention comovement. We highlight three insights from this panel. First, the explanatory power of the model decreases as we move from more to less sophisticated users. The R^2 in the analyst and EDGAR comovement regressions is equal to 11.9% and 21.9%, respectively, while the R^2 in the media and Google comovement regressions is equal to 8.8% and 0.7%, respectively. Second, the association between attention comovement and the firm's market value (*MktVal*), book-to-market ratio (*Bk/Mkt*), and analyst following is consistently positive across three of four models (excluding the Google regression), again indicating that large, value, and visible firms have higher attention comovement.[22] Overall, we find that several firm attributes, such as size and analyst following, are associated with attention comovement.

3.2. Attention Comovement and Excess Return Comovement

We next examine the association between attention comovement and stock market comovement. We examine whether variation in attention comovement incrementally explains variation in market comovement using the following regression:

$$\begin{aligned} ComoveRet_{i,t} &= \psi_{YEAR} + \psi_1 ComoveAttention_{i,t} + \psi_2 ROA_{i,t} \\ &\quad + \psi_3 MktVal_{i,t} + \psi_4 Bk/Mkt_{i,t} + \psi_5 SalesGrowth_{i,t} \\ &\quad + \psi_6 Inst_{i,t} + \psi_7 \#Analysts_{i,t} + \psi_8 StdROA_{i,t} \\ &\quad + \psi_9 Abs(Ret_{i,t}) + \psi_{10} StkTurn_{i,t} + \psi_{11} ComoveEarn_{i,t} \\ &\quad + \psi_{12} SP500_{i,t} + \psi_{13} Price_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{6}$$

where all variables are as defined above and in the appendix. Equation (6) includes year fixed effects, and statistical significance is assessed using standard errors clustered by firm. Our primary coefficient of interest is that on *ComoveAttention*, which captures the association between return comovement and attention comovement, after we control for the comovement in firm fundamentals and other firm characteristics associated with stock return comovement.

Panel A of Table 4 presents the results from estimating Equation (6), with $ComoveRet_{i,t}$ as the dependent variable. In panel A, we find that the coefficient on $ComoveA\text{-}Score_{i,t}$ is equal to 0.181 and is significant at the 1% level, providing evidence that attention comovement is positively associated with contemporaneous return comovement.[23] The inclusion of year fixed effects across the two models improves the explanatory power of the model by roughly 27%, indicating that fixed temporal effects help explain return comovement. The signs of the coefficients on the control variables are consistent with expectations and/or the prior literature. For example, we find a positive coefficient on firm size (*MktVal*) and institutional ownership (*Inst*), as well as a negative coefficient on earnings volatility (*StdROA*), consistent with Piotroski and Roulstone (2004). We also find that growth firms (*SalesGrowth*) and firms with more extreme returns during the fiscal year ($Abs(Ret_{i,t})$) are less likely to have comoving returns.

Table 3. Determinants of Attention Comovement

Panel A—Regression of composite attention comovement on firm-level determinants

	$ComoveA\text{-}Score_{i,t}$	$ComoveA\text{-}Score_{i,t}$
$ROA_{i,t}$	−0.209	−0.193
	−1.527	−1.405
$\ln(MktVal_{i,t})$	0.173***	0.171***
	8.041	7.953
$Bk/Mkt_{i,t}$	0.205***	0.207***
	6.010	6.008
$SalesGrowth_{i,t}$	−0.098**	−0.042
	−2.108	−0.877
$Inst_{i,t}$	0.048	0.045
	0.519	0.482
$\ln(\#Analysts_{i,t})$	0.274***	0.282***
	8.014	8.144
$StdROA_{i,t}$	−0.311*	−0.290
	−1.655	−1.532
$Abs(Ret_{i,t})$	0.045	0.020
	1.335	0.586
$StkTurn_{i,t}$	−1.061	−1.426
	−1.038	−1.371
$ComoveEarn_{i,t}$	0.003	0.004
	0.538	0.696
$SP500_{i,t}$	−0.046	−0.051
	−0.748	−0.822
$Price_{i,t}$	−0.001	−0.001
	−1.059	−0.945
No. of observations	6,051	6,051
R^2	0.197	0.200
FE–Year	N	Y
Cluster SE–Firm	Y	Y

Panel B—Regression of attention comovement components on firm-level determinants

	$ComoveAnalyst_{i,t}$	$ComoveEdgar_{i,t}$	$ComoveMedia_{i,t}$	$ComoveGoogle_{i,t}$
$ROA_{i,t}$	−0.389**	−0.533***	0.246	0.562***
	−2.029	−3.465	1.270	2.751
$\ln(MktVal_{i,t})$	0.104***	0.240***	0.186***	−0.022
	3.299	11.074	6.688	−0.845
$Bk/Mkt_{i,t}$	0.214***	0.232***	0.183***	0.008
	4.598	5.815	3.951	0.173
$SalesGrowth_{i,t}$	−0.101	0.004	−0.019	−0.045
	−1.491	0.059	−0.271	−0.587
$Inst_{i,t}$	0.187	−0.195*	0.069	0.040
	1.415	−1.891	0.609	0.339
$\ln(\#Analysts_{i,t})$	0.438***	0.226***	0.171***	−0.001
	8.858	5.966	3.724	−0.022
$StdROA_{i,t}$	−0.533*	0.205	−0.396	−0.068
	−1.911	0.955	−1.599	−0.259
$Abs(Ret_{i,t})$	0.007	0.135***	−0.055	−0.017
	0.152	3.355	−1.108	−0.318
$StkTurn_{i,t}$	−1.758	−0.238	−1.884	−2.358**
	−1.303	−0.227	−1.470	−2.039
$ComoveEarn_{i,t}$	0.011	−0.001	0.002	−0.006
	1.367	−0.121	0.199	−0.706
$SP500_{i,t}$	−0.148*	0.157***	−0.108	0.188**
	−1.709	2.640	−1.350	2.523
$Price_{i,t}$	0.000	−0.002	−0.002	−0.001
	0.049	−1.405	−1.328	−0.601
No. of observations	6,051	6,051	6,051	6,051
R^2	0.119	0.219	0.088	0.007
FE–Year	Y	Y	Y	Y
Cluster SE–Firm	Y	Y	Y	Y

Notes. The table presents the results of regressing composite attention comovement (panel A) or attention comovement components (panel B) on firm-level determinants. All variables are measured at the firm-year level and are defined in the appendix; *T*-statistics based on firm-clustered standard errors are presented below the coefficient estimates. The model includes untabulated year fixed effects (FE).

*, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Table 4. Return Comovement and Attention Comovement

Panel A—Regression of return comovement on contemporaneous aggregate attention comovement

	$ComoveRet_{i,t}$	$ComoveRet_{i,t}$
$ComoveA\text{-}Score_{i,t}$	**0.181*****	**0.183*****
	10.391	**10.768**
$ROA_{i,t}$	−0.187	−0.267*
	−1.285	−1.863
$\ln(MktVal_{i,t})$	0.305***	0.324***
	13.539	14.547
$Bk/Mkt_{i,t}$	0.302***	0.235***
	8.663	6.900
$SalesGrowth_{i,t}$	−0.194***	−0.149***
	−3.585	−2.597
$Inst_{i,t}$	0.326***	0.432***
	3.730	4.994
$\ln(\#Analysts_{i,t})$	0.018	−0.040
	0.577	−1.270
$StdROA_{i,t}$	−0.802***	−0.872***
	−3.989	−4.355
$Abs(Ret_{i,t})$	−0.181***	−0.196***
	−5.101	−5.585
$StkTurn_{i,t}$	2.876***	2.489**
	3.020	2.552
$ComoveEarn_{i,t}$	0.013**	0.010
	2.041	1.617
$SP500_{i,t}$	−0.508***	−0.530***
	−8.698	−9.145
$Price_{i,t}$	−0.004***	−0.003***
	−3.869	−3.221
No. of observations	6,051	6,051
R^2	0.244	0.310
FE–Year	N	Y
Cluster SE–Firm	Y	Y

Panel B—Regression of return comovement on contemporaneous components of attention comovement

	$ComoveRet_{i,t}$	$ComoveRet_{i,t}$	$ComoveRet_{i,t}$	$ComoveRet_{i,t}$
$ComoveAnalyst_{i,t}$	**0.107*****			
	8.523			
$ComoveEdgar_{i,t}$		**0.085*****		
		6.381		
$ComoveMedia_{i,t}$			**0.094*****	
			8.870	
$ComoveGoogle_{i,t}$				**-0.000**
				-0.017
$ROA_{i,t}$	−0.261*	−0.257*	−0.325**	−0.302**
	−1.785	−1.769	−2.269	−2.063
$\ln(MktVal_{i,t})$	0.344***	0.335***	0.338***	0.355***
	15.572	14.870	15.184	15.926
$Bk/Mkt_{i,t}$	0.250***	0.253***	0.256***	0.273***
	7.241	7.315	7.304	7.693
$SalesGrowth_{i,t}$	−0.146**	−0.157***	−0.155***	−0.156***
	−2.518	−2.727	−2.691	−2.696
$Inst_{i,t}$	0.420***	0.457***	0.434***	0.440***
	4.846	5.180	4.931	4.945
$\ln(\#Analysts_{i,t})$	−0.036	−0.008	−0.005	0.011
	−1.101	−0.247	−0.149	0.343
$StdROA_{i,t}$	−0.868***	−0.942***	−0.888***	−0.925***
	−4.303	−4.654	−4.374	−4.508
$Abs(Ret_{i,t})$	−0.193***	−0.204***	−0.187***	−0.192***
	−5.513	−5.758	−5.279	−5.410
$StkTurn_{i,t}$	2.416**	2.249**	2.405**	2.229**
	2.474	2.300	2.442	2.252
$ComoveEarn_{i,t}$	0.009	0.010*	0.010*	0.010*
	1.535	1.731	1.709	1.714
$SP500_{i,t}$	−0.524***	−0.553***	−0.530***	−0.540***
	−8.957	−9.291	−9.013	−9.000
$Price_{i,t}$	−0.003***	−0.003***	−0.003***	−0.003***
	−3.416	−3.269	−3.228	−3.388
No. of observations	6,051	6,051	6,051	6,051
R^2	0.302	0.295	0.300	0.289
FE–Year	Y	Y	Y	Y
Cluster SE–Firm	Y	Y	Y	Y

Notes. This table presents the results of regressing return comovement on contemporaneous composite attention comovement (panel A) or attention comovement components (panel B), including firm-level control variables. All variables are measured at the firm-year level and are defined in the appendix; *T*-statistics based on firm-clustered standard errors are presented below the coefficient estimates. The model includes untabulated year fixed effects (FE). Coefficients of interest are bolded.

*, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

We also find that return comovement is negatively related to membership in the S&P 500 (*SP*500) and stock price (*Price*), both of which are categories within which prior research shows returns comove. We interpret this result as follows: as long as the two categories are distinct, increased return comovement in one category (e.g., a stock index or a nominal price category) will, all else equal, lead to decreased comovement in another category (e.g., industry). For example, membership in the S&P 500 increases return comovement with other firms in the S&P 500; however, because these firms come from a variety of industries, this cross-industry comovement will, all else equal, result in a firm's returns comoving *less* with those of firms in its own industry.[24]

In panel B, we include each individual attention comovement variable separately. We find a positive and significant coefficient on each of the attention comovement variables, except for the coefficient on *ComoveGoogle*. The significant coefficients range from a low of 0.0850 on $ComoveEdgar_{i,t}$ to a high of 0.1070 on $ComoveAnalyst_{i,t}$. The results provide consistent evidence of a positive relation between return comovement and measures of attention comovement, even after we control for comovement in fundamentals. Overall, the results in Table 4 indicate that the comovement of investor attention is associated with the comovement of the firm's returns. Put another way, from the perspective of a given firm, if a firm receives idiosyncratic attention, it also tends to have more idiosyncratic returns.[25]

3.3. Lead-Lag Relationship Between Attention Comovement and Excess Return Comovement

In this section, we examine the lead-lag relationship between attention comovement and return comovement. Prior research has shown that extreme returns and volume can focus investor attention on a particular stock (e.g., Barber and Odean 2008), suggesting that market activity leads attention. However, information likely affected the extreme returns and volume in the first place. Thus, market activity and attention are likely jointly determined; as a result, return comovement and attention comovement are likely jointly determined. Thus, we cannot perfectly isolate attention comovement from return comovement. Instead, we can test whether each is incrementally predictive of the other. We do so by regressing return or attention comovement on lagged values of return comovement and lagged values of attention comovement, with all the same controls and fixed effects as employed in Equation (6).

The results of this test are presented in Table 5. In panel A, we present the results of lead-lag tests with the composite score of attention comovement (*ComoveA-Score*) and return comovement (*ComoveRet*).

Table 5. Lead-Lag Comovement Regressions

Panel A—Lead-lag regressions: Return comovement and aggregate attention comovement

	[1] $ComoveRet_{i,t}$	[2] $ComoveA\text{-}Score_{i,t}$
$ComoveA\text{-}Score_{i,t-1}$	0.060***	0.605***
	4.731	45.007
$ComoveRet_{i,t-1}$	0.403***	0.038***
	28.459	4.009
No. of observations	6,051	6,051
R^2	0.413	0.488
Controls	Y	Y
FE–Year	Y	Y
Cluster SE–Firm	Y	Y

Panel B—Lead-lag regressions: Return comovement and components of attention comovement

	[1] $Comove\ Ret_{i,t}$	[2] $Comove\ Ret_{i,t}$	[3] $Comove\ Ret_{i,t}$	[4] $Comove\ Ret_{i,t}$
$ComoveAnalyst_{i,t-1}$	0.046***			
	5.282			
$ComoveEdgar_{i,t-1}$		−0.016		
		−1.488		
$ComoveMedia_{i,t-1}$			0.039***	
			4.419	
$ComoveGoogle_{i,t-1}$				−0.002
				−0.219
$ComoveRet_{i,t-1}$	0.403***	0.412***	0.406***	0.412***
	28.423	29.298	28.723	29.209
No. of observations	6,051	6,051	6,051	6,051
R^2	0.414	0.411	0.413	0.411
Controls	Y	Y	Y	Y
FE–Year	Y	Y	Y	Y
Cluster SE–Firm	Y	Y	Y	Y

The results in the first column reveal that lagged values of attention comovement are significantly associated with current-period return comovement. Importantly, the model controls for lagged values of return comovement and current earnings comovement. Thus, we conclude that attention comovement is incrementally predictive of excess return comovement, which suggests that attention comovement has important capital market implications.

The results in the second column of panel A reveal that lagged values of return comovement are significantly associated with contemporaneous attention comovement, after we control for lagged attention comovement. Thus, both of our comovement measures have predictive associations with each other, and our primary relation of interest, the effect of attention comovement on return comovement, does hold in our setting. If attention comovement were merely a

Table 5. (Continued)

Panel C—Lead-lag regressions: Components of attention comovement and return comovement

	[1] $Comove\ Analyst_{i,t}$	[2] $Comove\ Edgar_{i,t}$	[3] $Comove\ Media_{i,t}$	[4] $Comove\ Google_{i,t}$
$ComoveAnalyst_{i,t-1}$	0.600***			
	46.663			
$ComoveEdgar_{i,t-1}$		0.321***		
		19.024		
$ComoveMedia_{i,t-1}$			0.377***	
			22.894	
$ComoveGoogle_{i,t-1}$				0.192***
				13.176
$ComoveRet_{i,t-1}$	0.052***	0.038**	0.071***	−0.026
	3.913	2.565	4.362	−1.364
No. of observations	6,051	6,051	6,051	6,051
R^2	0.465	0.289	0.225	0.045
Controls	Y	Y	Y	Y
FE—Year	Y	Y	Y	Y
Cluster SE—Firm	Y	Y	Y	Y

Notes. This table presents the results of lead-lag regressions in which attention comovement and return comovement are alternatively lagged and included as explanatory variables. In panel A, we present the results using the composite measure of attention comovement, whereas in panels B and C, we present the results using the components of attention comovement. All variables are measured at the firm-year level and are defined in the appendix; *T*-statistics based on firm-clustered standard errors are presented below the coefficient estimates. The model includes untabulated controls as in Table 4 and year fixed effects (FE).

*, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

"by-product" of return comovement, then we would not expect to find this particular result because the effect of attention comovement would be overshadowed by the effect of lagged return comovement. In summary, the evidence suggests that attention and return comovement are jointly determined, which suggests that attention comovement plays an incremental role in predicting return comovement.

In panels B and C, we present the results of lead-lag tests with each of the components of attention comovement and return comovement. Two of the four attention comovement components predict subsequent return comovement (*Analyst* and *Media*), while the other two components have no significant associations with respect to subsequent return comovement (*Edgar* and *Google*). This finding could suggest that comovement in information production (via analysts and the business press) helps explain future comovement in stock returns, while comovement in information acquisition does not. Going the other direction, we find that return comovement predicts comovement in three of the four attention components.

4. Attention Transfer

4.1. Attention Transfer to Peer Firms Around Earnings Announcements

In this section, we examine whether earnings announcements can serve as a mechanism through which attention comoves. This can occur when a given firm announces earnings, which influences market attention to a peer firm in the same industry; we call this idea "attention transfer." This idea is related to information transfer, in which information announced by one firm can be informative to investors in related firms (e.g., Foster 1981, Han et al. 1989, Ramnath 2002, Thomas and Zhang 2008). Evidence in prior research shows that the earnings announcement for a particular firm can lead to a significant market reaction for related firms. The theory behind intraindustry information transfer is that economic events that drive one firm's news are often related to economic events at peer firms (e.g., firms in the same industry). An untested underlying assumption in this literature is that investor attention comoves, as the earnings news for a given firm draws investor attention to related firms; i.e., attention transfer occurs.

In our final set of tests, we examine *attention transfer* by investigating whether earnings announcements also trigger investor attention in related peer firms. That is, we use the setting of intraindustry information releases to examine whether earnings information serves as a mechanism of attention comovement. We also examine whether the relation between the level of attention for a peer firm's earnings announcement is explained, in part, by the extent to which the firm's attention comoves. Finally, we compare attention transfer around an information-related event (a firm's earnings announcement) to attention transfer around a noninformation-related event (a firm reaching stock price highs or lows).

For these additional analyses, we measure the level of attention for a given firm-week (rather than the annual comovement of attention as in the previous section), which allows us to more precisely focus on investor attention around a corporate announcement. Further, to more precisely identify "peer" firms, we identify related firms as those operating in the same four-digit SIC code as a given firm.[26] Table 1, panel B reports the descriptive statistics for all variables measured at the firm-week level. The average weekly abnormal Google search (*Google*) is 0.024. The average number of analyst forecast revisions for a firm-week (*AnalystFor*) is 1.077, with a median of zero revisions. The average number of media articles (*Media*) is 17.215, with a median of six articles per firm-week. The average number of EDGAR downloads (*Edgar*) is 86 per firm-week, with a median of 56 downloads. In a computation similar to our calculation of *ComoveA-Score*, we calculate a composite attention variable, *A-Score*,

to capture the overall level of attention. We identify the principal factor using the four previously defined attention variables.[27] We present the Pearson correlations for our variables in panel B of Table 2. For the most part, each of the attention variables is positively related to the other attention variables. For example, the Pearson correlations between *Media*, *AnalystFor*, and *Edgar* range from 27% to 58%. $Google_{i,w}$ is positively related to the $AnalystFor_{i,w}$ and $Media_{i,w}$ measures, but to a much lesser degree.[28] $A\text{-}Score_{i,w}$ is positively related to each of the individual attention variables.

Our objective is to examine attention transfer within related firms. We empirically investigate attention transfer using a pooled regression of attention levels on indicators for event dates. Specifically, we regress the level of firm-specific attention, *Attention*, on an indicator variable for the week of the firm i's earnings announcement (*EA*) and an indicator for the week of a peer firm j's earnings announcement (*PeerEA*) as follows:

$$\begin{aligned} Attention_{i,w} &= \sigma_{YEAR} + \sigma_1 EA_{i,w} + \sigma_2 PeerEA_{j,w} + \sigma_3 MktVal_{i,q} \\ &\quad + \sigma_4 Bk/Mkt_{i,q} + \sigma_5 SalesGrowth_{i,q} + \sigma_6 ROA_{i,q} \\ &\quad + \sigma_7 Inst_{i,q} + \sigma_8 Uncertainty_{i,q} + \sigma_9 Comp_{i,q}, \\ &\quad + \sigma_{10} MOM_{i,q} + \varepsilon_{i,w}. \end{aligned} \tag{7}$$

Attention is one of five measures (*A-Score*, *Google*, *AnalystFor*, *Media*, and *Edgar*) of the level of attention for a given firm-week; all other variables are as previously defined in the text and the appendix. We include year fixed effects in the model and assess statistical significance using standard errors clustered by firm and week.

An intuitive way to view Equation (7) is that we are regressing the weekly level of attention paid to a given firm (say, Coca-Cola), on an indicator variable for the week in which Coca-Cola announces earnings (*EA*) and an indicator variable for the week in which a peer firm (say, PepsiCo) announces earnings (*PeerEA*), along with control variables. A significantly positive coefficient on *PeerEA* indicates that attention transfers between these two related firms around their earnings announcements. Figure 1, panel B provides a visual portrayal of the measurement of attention transfer around earnings announcements.

In Equation (7), we also include controls for firm i, including firm size, book-to-market, sales growth, return on assets, institutional ownership, analyst uncertainty, the competitiveness of the firm's industry, and recent stock return performance, all of which are measured as of the end of the previous fiscal quarter, q. It is important to note that we delete all firm-week observations in which the firm *and* another peer firm in the industry both announce earnings. When these two events happen simultaneously, it becomes more difficult to understand whether the increase in attention is related to the firm's earnings announcement or the peer firm's earnings announcement.[29] In estimating Equation (7), we include *EA* to capture the firm's level of attention during the week when it releases its own earnings, but we focus on *PeerEA* as the primary variable of interest because it captures the notion of attention transfer between related industry firms.

Table 6 presents the results of estimating Equation (7). In the leftmost column, we present the results using *A-Score* as the dependent variable, and in each of the subsequent columns, the dependent variable is one of the component attention variables. Across all five regressions we find that the coefficient on $EA_{i,w}$ is positive and significant, confirming that the level of investor attention significantly increases during the week of a firm's earnings announcement. Further, the coefficient on $PeerEA_{i,w}$ is positive and statistically significant for four of the five measures of attention.[30] This suggests that investors' attention for a given firm increases when a peer firm releases earnings to the public. That is, these results provide additional evidence for the transfer of attention across peer firms within an industry. Thus, an information event that increases attention for an announcing firm also increases attention across the industry; i.e., attention moves from the micro level to the macro level. When combined with our previous results, these results can be interpreted to suggest that attention transfer around earnings announcements serves as a mechanism for attention comovement.

4.2. Attention Transfer to Peer Firms Around Earnings Announcements, Partitioned on Attention Comovement

In this section, we link the concept of attention comovement with that of attention transfer. Specifically, we examine whether the results from Table 6, which support the concept of attention transfer, are affected by attention comovement. To do so, we estimate Equation (7) separately for two subsamples: firms with low attention comovement (i.e., with *ComoveA-Score* less than the sample median) and firms with high attention comovement (i.e., with *ComoveA-Score* above the sample median). The objective of this test is to investigate whether the positive relation between investor attention and a peer firm's earnings announcement is conditional on the extent to which the firm's attention generally comoves with that of firms in the industry. To be clear, in this analysis, we examine how the *level of attention* given to peer-firm earnings news is affected by *attention comovement*.

In Table 7, we present results with *A-Score* as the dependent variable. For firms with low and high levels of attention comovement, we find a positive and

Table 6. Attention Transfer: Level of Attention Around Peer Firm Earnings Announcements

	$A\text{-}Score_{i,w}$	$AnalystFor_{i,w}$	$Edgar_{i,w}$	$Media_{i,w}$	$Google_{i,w}$
$EA_{i,w}$	1.734***	1.637***	0.429***	1.582***	0.032***
	69.276	86.171	17.165	54.812	6.281
$PeerEA_{i,w}$	**0.151*** **	**0.016**	**0.134*** **	**0.209*** **	**0.008*** **
	9.092	**1.620**	**7.405**	**10.643**	**3.038**
$\ln(MktVal_{i,q})$	0.463***	0.150***	0.375***	0.529***	−0.002***
	57.150	29.081	44.758	42.484	−3.216
$Bk/Mkt_{i,q}$	0.214***	0.118***	0.124***	0.238***	−0.001
	8.167	8.738	4.911	6.221	−0.765
$SalesGrowth_{i,q}$	0.008	0.047***	−0.052**	0.014	0.003
	0.351	3.388	−2.369	0.459	1.388
$ROA_{i,q}$	−2.451***	−0.688***	−2.023***	−2.863***	−0.004
	−10.598	−5.318	−9.194	−8.099	−0.152
$Inst_{i,q}$	0.084	0.092***	0.269***	−0.303***	−0.000
	1.462	3.277	4.591	−3.799	−0.072
$Uncertainty_{i,q}$	0.080***	0.020***	0.079***	0.085***	−0.002
	7.631	4.105	7.454	5.459	−1.552
$Comp_{i,q}$	−0.081	0.251***	−0.385***	−0.136*	−0.002
	−1.446	8.078	−6.505	−1.734	−0.763
$MOM_{i,q}$	−0.142***	−0.050**	−0.125***	−0.141***	−0.010**
	−4.361	−2.464	−3.510	−3.626	−2.423
No. of observations	239,400	239,400	239,400	239,400	239,400
R^2	0.564	0.248	0.569	0.423	0.002
Cluster SE–Week	Y	Y	Y	Y	Y
Cluster SE–Firm	Y	Y	Y	Y	Y
Fixed effects–Year	Y	Y	Y	Y	Y

Notes. This table presents the results of regressing the level of attention (both composite and component measures) on indicators for earnings announcement dates for the firm (*EA*) and its peer firms (*PeerEA*). In this table, all variables are measured at the firm-week level and are defined in the appendix; *T*-statistics based on firm- and week-clustered standard errors are presented below the coefficient estimates. The model includes untabulated year fixed effects. Coefficients of interest are bolded.

*, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

significant coefficient on *PeerEA*, consistent with attention transfer occurring for both subsamples. However, and most importantly for this test, we find that the coefficient for *PeerEA* is greater for the firms with higher overall levels of attention comovement. Specifically, we find that the coefficient on *PeerEA* for the high attention comovement subsample is 0.194, while the coefficient for the firms with low attention comovement is 0.110.[31] This represents a 76% higher level of attention transfer for the high attention comovement subsample. A cross-equation test confirms that these coefficients are statistically different from each other at the 1% level. This finding suggests that firms with investor attention that is generally more strongly associated with the amount of attention paid to their industry experience greater increases in investor attention when a peer firm in that industry discloses news to the public. In other words, firms that receive more (less) firm-specific attention are less (more) likely to receive attention when firms in their industry release news. We also find that the coefficient on $EA_{i,w}$ is lower for firms with high attention comovement; this difference is statistically significant but economically much smaller than the differential results of $PeerEA_{i,w}$ across the two subsamples. This finding is consistent with earnings announcements containing less firm-specific information for firms whose attention is strongly tied to industry levels of attention.

Overall, these results support the idea that significant firm events can trigger investors to pay attention to other firms that are in the same industry and that this relation is stronger for firms with greater industry and market attention comovement. In other words, one reason attention comoves is that information announcements by firms in an industry affect the level of attention paid to peer firms in the same industry.

4.3. Attention to Peer Firms Around Earnings Announcements and Stock Price Highs/Lows

In our final set of analyses, we examine whether an event unrelated to firm fundamentals—namely, stock price highs and lows—is associated with increased firm and peer firm attention. Our objective in this analysis is to understand whether attention comovement is related to the quality of the information signal. Huddart et al. (2009) provide evidence to suggest that stock price paths affect trading decisions largely because of investor bounded rationality and (presumably) not because of the information content of the price path.[32]

Table 7. Attention Transfer: Level of Attention Around Peer Firm Earnings Announcements, Partitioned on Attention Comovement

	$A\text{-}Score_{i,w}$		
	$LowComove_{i,t}$	$HighComove_{i,t}$	Difference P-value
$EA_{i,w}$	1.777***	1.639***	−0.138***
	72.018	46.454	−3.887
$PeerEA_{i,w}$	**0.110*** **	**0.194*** **	**0.083*** **
	7.121	**9.481**	**5.485**
$\ln(MktVal_{i,q})$	0.429***	0.491***	
	39.986	48.542	
$Bk/Mkt_{i,q}$	0.190***	0.237***	
	6.615	6.388	
$SalesGrowth_{i,q}$	0.021	−0.031	
	0.756	−1.041	
$ROA_{i,q}$	−2.503***	−2.010***	
	−10.743	−5.212	
$Inst_{i,q}$	0.052	0.190**	
	0.817	2.346	
$Uncertainty_{i,q}$	0.074***	0.087***	
	5.596	6.018	
$Comp_{i,q}$	−0.095	−0.061	
	−1.489	−0.849	
$MOM_{i,q}$	−0.146***	−0.139***	
	−4.990	−3.285	
No. of observations	119,683	119,717	
R^2	0.526	0.569	
Cluster SE–Week	Y	Y	
Cluster SE–Firm	Y	Y	
Fixed effects–Year	Y	Y	

Notes. This table presents the results for which the level of attention (both composite and component measures) is regressed on indicators for earnings announcement dates for the firm (*EA*) and its peer firms (*PeerEA*). We partition the sample on whether the firm's annual attention comovement is below or above the sample median (*LowComove* and *HighComove*, respectively). In this table, all variables are measured at the firm-week level and are defined in the appendix; *T*-statistics based on firm- and week-clustered standard errors are presented below the coefficient estimates. The model includes untabulated year fixed effects. Coefficients of interest are bolded.

*, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

Therefore, we compare the attention to peer firm events related to a fundamental signal (earnings news) and a nonfundamental signal (stock price highs/lows) to better understand whether attention comovement is related to the quality of the information signal.

We empirically examine this assertion by augmenting Equation (7) with indicators for the firm's 52-week high and low (labeled *Firm52WeekHigh* and *Firm52WeekLow*, respectively) and indicators for the peer firm's 52-week high and low (labeled *Peer52WeekHigh* and *Peer52WeekLow*, respectively). All other facets of the empirical estimation are the same as in Table 6. We report the results of this test in Table 8. Just as in Table 6, we find that the coefficient on the peer firm's earnings announcement, *PeerEA*, is positive and significant. However, we find that the coefficients on the high peer stock price path, *Peer52WeekHigh*, for the peer firm are negative and significant. The coefficients on the low peer stock price path variables, *Peer52WeekLow*, are largely insignificant. The contrast in these coefficients provides insights into the type of information that affects attention transfer. That attention significantly transfers for earnings but not for stock price paths suggests that the higher the quality of the information signal, the more likely the attention is to transfer.

5. Conclusion

This paper investigates the extent to which the amount of attention a firm receives from investors and other market participants comoves with the amount of attention paid to its industry and the market as whole. We also examine the capital market impact of this attention comovement. We find that approximately one-fifth

Table 8. Attention Transfer: Level of Attention Around Peer Firm Earnings Announcements and 52-Week Highs and Lows

	$A\text{-}Score_{i,w}$	$AnalystFor_{i,w}$	$Edgar_{i,w}$	$Media_{i,w}$	$Google_{i,w}$
$EA_{i,w}$	1.710***	1.628***	0.416***	1.548***	0.031***
	69.380	85.195	17.100	53.801	6.015
$PeerEA_{i,w}$	**0.152*** **	**0.017*** *	**0.146*** **	**0.195*** **	**0.007*** **
	9.941	1.741	8.305	11.213	2.880
$Firm52WeekHigh_{i,t}$	0.188***	0.071***	−0.028**	0.425***	0.019***
	15.059	6.856	−2.518	15.794	7.687
$Firm52WeekLow_{i,t}$	0.396***	0.167***	0.222***	0.511***	0.019***
	18.793	8.983	8.880	16.768	5.486
$Peer52WeekHigh_{i,t}$	**−0.059*** **	**−0.021*** *	**−0.089*** **	**−0.008**	**−0.000**
	−3.972	**−2.270**	**−5.884**	**−0.375**	**−0.056**
$Peer52WeekLow_{i,t}$	**0.017**	**0.004**	**−0.022**	**0.071*** **	**0.001**
	1.215	**0.448**	**−1.426**	**3.406**	**0.477**
No. of observations	238,285	238,285	238,285	238,285	238,285
R^2	0.578	0.254	0.575	0.445	0.003
Controls	Y	Y	Y	Y	Y
Cluster SE–Week	Y	Y	Y	Y	Y
Cluster SE–Firm	Y	Y	Y	Y	Y
Fixed effects–Year	Y	Y	Y	Y	Y

Notes. This table presents the results for which the level of attention (both composite and component measures) is regressed on indicators for earnings announcement dates for the firm (*EA*) and its peer firms (*PeerEA*). In addition, the specification includes $Peer52WeekHigh_{i,t}$ and $Peer52WeekLow_{i,t}$, which are indicators for the dates during which a peer firm's stock price hits an annual high or low. The specification also includes $Firm52WeekHigh_{i,t}$ and $Firm\ 52WeekLow_{i,t}$, which are indicators for the dates during which the firm's stock price hits an annual high or low. In this table, all variables are measured at the firm-week level and are defined in the appendix; *T*-statistics based on firm- and week-clustered standard errors are presented below the coefficient estimates. The model includes untabulated year fixed effects. Coefficients of interest are bolded.

*, **, and *** indicate statistical significance at 10%, 5%, and 1%, respectively.

of the variation in firm-specific attention is explained by industry and market attention. Further, we identify specific firm characteristics that are related to the level of this attention comovement. We find that large, value firms with higher analyst following have higher attention comovement. We also show that the comovement in attention is positively associated with the comovement in stock returns, which suggests that comovement in stock returns and trading outcomes is partially driven by the actions of investors who view individual firms in the context of categories such as industry. Finally, we document that an important information event, peer firm earnings announcements, can increase attention for related firms, which once again suggests an industry component to attention. We document that this effect is more pronounced for firms that are more likely to receive attention at the same time as other firms in the industry and market and that it differs from the attention-transfer effect of a noninformation event (stock price highs and lows).

Our results suggest that information flows (proxied by our attention measures) help explain comovement in excess stock returns. This finding is consistent with the arguments in Barberis et al. (2005) that comovement in returns is driven by investors categorizing firms according to similar characteristics, by investors trading subsets of stocks rather than individual stocks, and by information diffusion across stocks occurring at different rates for stocks in different categories. We show that when information flows for a stock are more focused on the stock and are less explained by industry and market information flows, returns for the stock are more idiosyncratic. These information flows across firms are associated with firm-level information events. Overall, our results suggest that information flows at least partially explain comovement in stock returns. Future research can continue to explore the characteristics and events associated with these forms of comovement, as well as the implications of their relation.

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Appendix

Variable	Definition
	Comovement variables
$ComoveGoogle_{i,t}$	Equal to the logarithmic transformation of the R^2, defined as $\log(R^2/(1-R^2))$, using the following model using data over the 52-week period prior to the fiscal year end for firm i in year t: $Google_{i,w} = \alpha + \alpha\ IndGoogle_{i,w} + MktGoogle_{i,w} + \varepsilon$. $Google_{i,w}$ is equal to the average value of raw Google SVI for week w minus the median SVI over the past eight weeks, scaled by the median SVI for the past eight weeks plus 1. $IndGoogle_{i,w}$ is equal to the equally weighted $Google_{i,w}$ search volume for industry j (defined as two-digit SIC code) in week w (not including firm i). $MktGoogle_{i,w}$ is equal to the equal-weighted Google search volume for all firms with Google search volume in week w (not including firm i).
$ComoveAnalyst_{i,t}$	Calculated similarly to the $ComoveGoogle_{i,t}$ variable using the number of analyst forecasts issued during week w for firm i.
$ComoveMedia_{i,t}$	Calculated similarly to the $ComoveGoogle_{i,t}$ variable using the number of media articles written during week w for firm i.
$ComoveEdgar_{i,t}$	Calculated similarly to the $Comove\ Google_{i,t}$ variable using the number of searches for 10-K or 10-Q forms during week w for firm i.
$ComoveA\text{-}Score_{i,t}$	A factor analysis using the $ComoveGoogle_{i,t}$, $ComoveAnalyst_{i,t}$, $ComoveMedia_{i,t}$, and $ComoveEdgar_{i,t}$ variables to identify the common factor and calculate the $ComoveA\text{-}Score_{i,t}$ variable for firm i during year t.
$ComoveA\text{-}Score_{i,t-1}$	Same as the $ComoveA\text{-}Score_{i,t}$ variable calculated for the fiscal year $t-1$.
$ComoveRet_{i,t}$	Calculated similarly to the attention comovement variables using returns rather than attention.
$ComoveRet_{i,t-1}$	Same as the $ComoveRet_{i,t}$ variable calculated for the fiscal year $t-1$.
$GoogleR^2_{i,t}$	The average R^2 from the model used to calculate the $ComoveGoogle_{i,t}$ variable.
$AnalystR^2_{i,t}$	The average R^2 from the model used to calculate the $ComoveAnalyst_{i,t}$ variable.
$MediaR^2_{i,t}$	The average R^2 from the model used to calculate the $ComoveMedia_{i,t}$ variable.
$EdgarR^2_{i,t}$	The average R^2 from the model used to calculate the $ComoveEdgar_{i,t}$ variable.
	Firm-year variables
$ROA_{i,t}$	Equal to net income for firm i in year t scaled by total assets in year $t-1$.
$MVE_{i,t}$	Equal to the market value of equity for firm i at the end of fiscal year t.
$Bk/Mkt_{i,t}$	Equal to the book value of equity divided by the market value of equity for firm i in year t.
$SalesGrowth_{i,t}$	Equal to sales in year t divided by sales in year $t-1$ for firm i.
$Inst_{i,t}$	Equal to the percentage of firm i's shares owned by institutions in year t.
$\#Analysts_{i,t}$	Equal to the number of analysts following firm i in year t.
$StdROA_{i,t}$	Equal to the standard deviation of return on assets between year $t-4$ and t for firm i.
$Abs(Ret_{i,t})$	Equal to the buy and hold abnormal monthly return for firm i in fiscal year t.
$StkTurn_{i,t}$	Equal to the stock turnover for firm i in year t.
$ComoveEarn_{i,t}$	Equal to the logarithmic transformation, defined as $\log(R^2/(1-R^2))$, of the R^2 from a regression of the firm's return on assets on an equally weighted industry index of ROA using quarters $t-11$ through t (not including firm i).
$Price_{i,t}$	Equal to the stock price for firm i at the end of fiscal year t.
	Firm-week variables
$Google_{i,w}$	Equal to the average value of raw Google SVI for week w for firm i minus the median weekly SVI over the past eight weeks, scaled by the median SVI for the past eight weeks plus 1.
$AnalystFor_{i,w}$	Equal to the number of analyst forecasts issued in week w for firm i.
$Media_{i,w}$	Equal to the number of news articles that mentioned firm i in week w.
$Edgar_{i,w}$	Equal to the number of searches for firm i's 10-K or 10-Q forms through the EDGAR search platform in week w.
$A\text{-}Score_{i,w}$	A factor analysis using the $Google_{i,w}$, $AnalystFor_{i,w}$, $Media_{i,w}$, and $Edgar_{i,w}$ variables to identify the common factor and calculate the $A\text{-}Score_{i,t}$ variable for firm i during week w.
$EA_{i,w}$	Equal to 1 during the week firm i announces earnings and 0 otherwise.
$PeerEA_{i,w}$	Equal to 1 for firm i in week w if a peer firm (i.e., a firm in the same four-digit SIC code) announces earnings in week w and 0 otherwise.
$Firm52WeekHigh_{i,w}$	An indicator variable equal to 1 when the stock price during the week is the highest it has been over the last 52 weeks for firm i.
$Firm52WeekLow_{i,w}$	An indicator variable equal to 1 when the stock price during the week is the lowest it has been over the last 52 weeks for firm i.
$Peer52WeekHigh_{i,w}$	An indicator variable equal to 1 when the stock price during the week is the highest it has been over the last 52 weeks for at least one firm in the same four-digit SIC code.
$Peer52WeekLow_{i,w}$	An indicator variable equal to 1 when the stock price during the week is the lowest it has been over the last 52 weeks for at least one firm in the same four-digit SIC code.
$MktVal_{i,q}$	Equal to the market value for firm i calculated at the end of the fiscal quarter q.
$Bk/Mkt_{i,q}$	Equal to the book value of equity divided by the market value of equity for firm i in quarter q.
$SalesGrowth_{i,q}$	Equal to the sales in quarter q divided by sales in quarter $q-4$ for firm i.
$ROA_{i,q}$	Equal to net income before extraordinary items in quarter q scaled by total assets in quarter $q-4$ for firm i.

Appendix. (Continued)

Variable	Definition
	Firm-week variables (continued)
$Inst_{i,q}$	Equal to the percentage of firm i's shares held by institutional investors in quarter q and equal to 0 if missing.
$Uncertainty_{i,q}$	Equal to the average squared analyst forecast error for firm i during quarter q, as presented in Barron et al. (1998, 2002). Specifically, we compute the variable with the following equation: $(1-(1/N))*\cdot D+SE$, where N is the number of analysts following the firm, D is the dispersion of analyst forecasts, and SE is the squared error in the mean forecast. Finally, we scale by the mean forecast for the quarter.
$Comp_{i,q}$	Equal to 1 minus the Herfindahl–Hirschman index, which is calculated at the annual level. We first divide the firm's annual sales by the total industry (four-digit SIC code) sales, then square the ratio. We then sum the squared ratio by industry.
$MOM_{i,q}$	Equal to the buy and hold daily return during quarter $q-1$ for firm i.

Endnotes

[1] For example, prior work employs firm-specific measures of attention, such as trading volume (Hou et al. 2009), past returns (Aboody et al. 2010), 52-week highs (Li and Yu 2012), business press articles (Da et al. 2011), Google searches (Da et al. 2011), or downloads from the U.S. Securities and Exchange Commission's Electronic Data Gathering, Analysis, and Retrieval (EDGAR) database (deHaan et al. 2015) to identify firms that are likely experiencing higher levels of investor attention.

[2] For example, Kumar and Lee (2006) show that individuals—retail investors, in particular—buy and sell stocks within natural "habitats" or groups driven in part by attention-based trading or correlated investor sentiment.

[3] The literature provides some evidence, albeit indirect, of a relation between the *level* of attention a firm receives and return comovement. Piotroski and Roulstone (2004) and Chan and Hameed (2006) both find a positive association between analyst forecasting activities—which are sometimes used as a proxy for investor attention—and return comovement, suggesting that analysts increase the amount of industry-level information in prices. Relatedly, Brandt et al. (2010) find that around events that grab the attention of individual investors, increases in retail investor trading are related to increases in idiosyncratic risk and, thus, to decreases in return comovement.

[4] It is difficult to assess the appropriate level of attention comovement: a low amount would suggest that a firm's attention is predominantly idiosyncratic, while a high amount would suggest that a firm's attention is predominantly systematic. In prior research on returns comovement, researchers are silent as to the optimal level of returns comovement. Similarly, assessing the appropriate level of attention comovement is beyond the scope of this study. Our primary focus is to show the existence and effects of attention comovement.

[5] These categories include size (Fama and French 1993), book-to-market ratio (Fama and French 1993), stock price (Green and Hwang 2009), industry membership (Kallberg and Pasquariello 2007), stock index membership (Barberis et al. 2005), investment banking networks (Grullon et al. 2014), and analyst following (Muslu et al. 2014).

[6] For example, Grullon et al. (2014) propose that the returns of firms sharing a lead underwriter comove because the lead underwriters share information about these firms with investors; however, these information flows are not observable.

[7] Another way to distinguish our work is to note that comovement studies to date basically focus on finding categories and showing that firms in the category comove with each other more than they comove with firms outside the category. Our work has more in common with the traditional synchronicity literature (e.g., Morck et al. 2000), which investigates determinants of the *level* of comovement within a particular category (in our case, industry).

[8] There is evidence that the market reaction to price paths, such as 52-week highs and lows, is likely driven by behavioral factors such as bounded rationality (Huddart et al. 2009).

[9] This idea that one firm's news leads to a related firm's market reaction is captured in the information transfer literature, as in Foster (1981) and Thomas and Zhang (2008), among others. Our study shows that one firm's news is related to the attention paid to a related peer firm, which we call attention transfer.

[10] We employ weekly rather than daily Google search data because they allow us to investigate a much broader sample of firms. As discussed in Drake et al. (2012), daily Google search data are available only for larger, well-recognized firms. Da et al. (2011) is another example of prior research using weekly Google search data.

[11] For example, the SVI for the term "super bowl" shows a strong increase in Google searches by users in January and February of each year. See http://www.google.com/trends/?q=super+bowl (accessed June 27, 2016).

[12] In addition, we delete from our sample any ticker symbols with potential alternative meanings (e.g., "CAT," "TOY," "MAT").

[13] We count all revisions on the same date by the same analyst for the same firm as a single analyst revision. We set all firm-weeks with no recorded analyst revisions to zero as long as we are able to find some analyst coverage during that calendar year.

[14] We set all firm-weeks with no recorded news articles to zero as long as we are able to find some media coverage during that calendar year.

[15] We apply the logistic transformation to the R^2 to convert the bounded distribution (i.e., the R^2 is bounded between 0 and 1) into an unbounded distribution. This approach has been used in other studies that employ a bounded dependent variable (e.g., Piotroski and Roulstone 2004, Bushman et al. 2004).

[16] These variables are calculated similarly to how they are calculated in the prior literature (Morck et al. 2000, Piotroski and Roulstone 2004). However, the prior literature labels them "synchronicity" variables. We use the general term "comovement" to refer to correlations in returns, trading volume, fundamentals, and our attention proxies across firms in the same industry.

[17] After evaluating the scree plot of the eigenvalues from the principal factor analysis that includes all four attention variables ($SyncGoogle_{i,t}$, $SyncAnalyst_{i,t}$, $SyncMedia_{i,t}$, and $SyncEdgar_{i,t}$), we retain a single factor. The inflection point in the graph occurs after factor 1.

[18] The insignificant correlation between *ComoveA-Score* and *ComoveGoogle* highlights the unique nature of Google search among the attention variables. While EDGAR search, analyst reports, and media articles are the products of sophisticated market participants, Google search is potentially less likely to represent sophisticated information acquisition. For robustness, we created a new *ComoveA-Score* variable that excludes Google search as an attention measure. Untabulated results with this alternative composite attention measure are quantitatively similar to those presented in the paper.

[19] We do not include firm fixed effects in these tests because we have only four years of data. Therefore, in these tests, we largely examine

cross-sectional variation in attention comovement. To our knowledge, no other comovement paper in the literature uses firm fixed effects.

[20] Specifically, in our annual analyses (as reported in Tables 3–5), we cluster standard errors by firm but do not cluster by year because we have only four years of data in the panel. Cameron et al. (2008) state that "with a small number of clusters the cluster-robust standard errors are downwards biased" (p. 414) and suggest using bootstrapped standard errors. Therefore, in untabulated analyses, we use bootstrapped (1,000 replications) standard errors that are clustered by year and firm. All coefficients of interest are qualitatively similar, with four exceptions: the coefficient on the $Abs(Ret_{i,t})$ variable in the $ComoveEdgar_{i,t}$ regression (see Table 3, panel B) is insignificant, the coefficient on the $ROA_{i,t}$ variable is negative and significant at the 10% level in the $ComoveAnalyst_{i,t}$ regression (see Table 3, panel B), the coefficient on the $ComoveA\text{-}Score_{i,t}$ variable is significant at the 10% level in the $ComoveRet_{i,t}$ regression (see Table 5, panel A), and the coefficient on the $ComoveRet_{i,t}$ variable is insignificant in the $ComoveEdgar_{i,t}$ regression (see Table 5, panel C). In our weekly analyses (as reported in Tables 6–8), in which we have many observations along both time and firm dimensions, we cluster standard errors by firm and week. All models include year fixed effects as well.

[21] When we include the lag of $ComoveA\text{-}Score_{i,t}$ as an additional independent variable, we find that the R^2 increases considerably (0.486).

[22] A potential concern regarding the relation between attention comovement and firm size is that the two are mechanically related because larger firms make up a larger portion of the industry and will therefore have a larger impact on the measure of attention comovement. However, as discussed previously, the measure of attention comovement is constructed on an equal-weighted basis and excludes the incremental impact of firm i's attention. Therefore, because of these two factors, it is unlikely that this relation is purely mechanical.

[23] We note that these results are similar when we value-weight the industry and market measures used to calculate the comovement of attention and return comovement variables.

[24] For example, when American Airlines was recently added to the S&P 500 index, its stock return likely began to comove with the index, which includes a very broad set of companies such as Home Depot, Humana, and Google from many different industries. However, as a result of comoving more with an index made up of very diverse firms, all else equal, the stock return of American Airlines likely began to comove less with its airline industry return.

[25] We note that all our results in Tables 4 and 5 are qualitatively similar if we examine the relation between attention comovement and the extent to which trading volume of a firm comoves with trading volume of the firm's industry and the market as a whole. Thus, attention comovement is related to two market-based measures of comovement.

[26] We use four-digit SIC codes to identify firms that are most likely to have similar operations. In addition, we use four-digit SIC codes to limit the number of peer firm-weeks for a single earnings announcement. Using four-digit SIC codes, we identify approximately 36% of all firm-week observations to be weeks in which peer firms announce earnings. Making the industry definition broader (e.g., by using two-digit SIC codes) will increase this percentage considerably and reduce the power of our tests because a much higher percentage of firm-weeks become weeks in which peer firms announce earnings.

[27] After evaluating the scree of the eigenvalues plot from the principal factor analysis that includes all four attention variables ($Google_{i,w}$, $AnalystFor_{i,w}$, $Media_{i,w}$, and $Edgar_{i,w}$), we retain a single factor. The inflection point in the graph occurs after factor 1.

[28] The Pearson correlation between $Google_{i,w}$ and $Edgar_{i,w}$ is negative; however, the Spearman correlation is insignificant.

[29] We note that if we include these firm-weeks and add a variable for the interaction of *EA* and *PeerEA*, the coefficients on *EA* and *PeerEA* are similar to those reported.

[30] Some of the t-statistics in the models in Tables 6–8 are quite large. We have examined several different treatments for residual correlation, but, by and large, the standard errors are quite small, which results in large test statistics. This is likely the result of both a levels-based regression and a large number of observations.

[31] In untabulated analyses, we confirm that the coefficients on *PeerEA* are inferentially similar for each of the component attention variables, with two exceptions. First, the *EA* variables for the high and low comovement samples are insignificantly different when $Google_{i,w}$ is the dependent variable. Second, the *EA* variable is higher for the high comovement subsample in the $AnalystFor_{i,w}$ regression.

[32] Yuan (2015) also finds that marketwide attention-grabbing events, such as the record highs/lows for the Dow, are associated with investor trading.

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