Asymmetric Attention and Stock Returns*

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Abstract

This paper constructs a measure of attention allocation by locals and nonlocals towards S&P 500 stocks using aggregate search volume in Google. We find that (i) investors bias their attention allocation towards local stocks, which suggests that investors choose to have a local information advantage; and (ii) firms attracting abnormally high asymmetric attention from local relative to nonlocal investors earn higher returns. These results are consistent with informational-based theories of attention allocation. The empirical implication of these theories is that one can infer the arrival of unobservable private information by observing investors' attention allocation behavior.

Keywords: Limited attention, Geography, Asymmetric Information, Stock Returns.

JEL Codes: G12, G14, D82.

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1 Introduction

This paper brings together two strands of the literature in finance that study the role of *i)* geography and *ii)* limited attention in financial decisions. There is substantial evidence suggesting that investors possess local information advantages and supporting the role of geography in finance. It is also well documented that investors have limited attention and need to choose what to learn. Our contribution to both literatures is to examine the attention allocation decisions of local relative to nonlocal investors and study its asset pricing implications. This paper is also closely related to a growing literature exploring the effects of geography on asset prices (i.e., Pirinsky and Wang, 2006, and Garcia and Norli, 2012).

The challenge when taking attention allocation theories to the data is to find direct measures of information processing efforts. Previous research used different indirect measures of attention such as advertising expenses (i.e., Lou, 2008), media coverage (i.e., Fang and Peress, 2009), abnormal trading volume (i.e., Hou, Peng, and Xiong, 2008), extreme returns (i.e., Barber and Odean, 2008) and the state of the business cycle (Kacperczyk, van Nieuwerburgh, and Veldkamp, 2010). Recent work by Mondria, Wu, and Zhang (2010) and Da, Engelberg, and Gao (2010) overcame this challenge by using measures of aggregate search frequency from AOL and Google search engines, respectively, as direct measures of attention. As argued by Da, Engelberg and Gao (2010), if a search engine user is searching for a company ticker, it is highly likely that this user is interested in financial information about the company. Notwithstanding, the distinction between the effort exerted by locals relative to nonlocals remains a challenge to the evaluation of current attention allocation theories.

We obtain direct measures of such efforts by exploring a new feature of Google Insights for Search that allows us to distinguish the location, by U.S. state, in which searches are performed. We document that, on average, investors search for 43% more information about local stocks than nonlocal stocks. Because we focus on information that is publicly available, we believe our findings cannot be solely explained by differences in information acquisition costs for locals relative to nonlocals. Our findings imply that investors endogenously choose to have a local information advantage.

We then construct a measure of abnormal asymmetric attention, which captures unusual patterns on the attention allocated to a stock by locals relative to nonlocals, and explore its asset pricing implications. An increase in abnormal asymmetric attention means that local investors are allocating an unusually large amount of their attention budget to learning public information about a local stock and, more importantly, that such unusual behavior is not observed in nonlocal investors. We focus on stocks included in the S&P 500 between January 2004 and December 2009. A portfolio that goes long on stocks with high asymmetric attention and short on stocks with no asymmetric attention has a Jensen's alpha of 46 basis points (bps hereafter) per month that is statistically and economically significant. We find our results to be robust to different statistical techniques such as Fama and MacBeth (1973) and panel regressions. Our results are also robust to DGTW characteristic-adjusted abnormal returns, which are constructed using the method developed by Daniel, Grinblatt, Titman, and Wermers (1997).

There are behavioral-based and informational-based explanations of how attention allocation decisions affect asset prices. Both have different implications for unconditional stock returns. Behavioral-based explanations such as Barber and Odean (2008) and Da, Engelberg, and Gao (2010) suggest that "*investors are net buyers of attention-grabbing stocks*". This implies that an increase in attention about a stock by local or nonlocal investors leads to an increase in asset prices. Informational-based explanations such as van Nieuwerburgh and Veldkamp (2009 and 2010) and Mondria and Wu (2010) suggest that investors choose to process more information about local than nonlocal stocks and, compared to the market portfolio, hold a greater proportion of these assets when locals have a small informational advantage. This implies that an increase in attention about a stock by local relative to nonlocal investors leads to an increase in asset prices.

Overall, our main empirical findings are consistent with informational-based explanations of attention allocation decisions. However, this should not rule out behavioral-based explanations of attention allocation decisions as these theories have wide support at higher frequency such as weekly data as reported by Da, Engelberg, and Gao (2010).

To further examine the predictions of infomational-based explanations of attention allocation decisions, we study whether the empirical results become more significant for stocks in which asymmetric information is more evident. We find that the return differential between the high-asymmetry and no-asymmetry portfolios is more pronounced for stocks located in more remote places where exogenous asymmetric information is more valuable. Specifically, we find a Jensen's alpha of 82 bps per month for the long-short portfolio sorted by asymmetric attention for stocks located in remote areas. We also find that the return differential between the high-asymmetry and no-asymmetry portfolios is more pronounced for more illiquid stocks.

Our paper contributes to the literature that analyzes the role of geography in finance initiated by Coval and Moskowitz (1999, 2001). They provide evidence suggesting that investors possess local information advantages. Our findings suggest that part of this local information advantage is endogenous as local investors choose to process more information about local stocks than nonlocal investors.

There is a large and growing number of studies which support the link between proximity and stock market participants' behavior. Malloy (2005) and Bae, Stulz, and Tan (2008) study the link between geographic proximity and analyst behavior. Portes and Rey (2005) document a close relationship between international capital flows and distance between countries. Ivkovic and Weisbenner (2005) show that individual investors tilt their portfolio towards local assets and earn additional returns. Grote and Umber (2006) and Uysal, Kedia, and Panchapagesan (2008) provide evidence relating proximity with success in mergers and acquisitions deals. Our results are different from previous work in the geography literature. One particular implication from Coval and Moskowitz (1999, 2001) and Ivkovic and Weisbenner (2005) is that companies located in more remote areas suffer from more information asymmetries and, thus, should earn higher returns. Our paper takes this result one step further. Abnormal asymmetric attention captures asymmetric patterns of endogenous information processing and allow us to predict whether and when stocks located in remote areas will actually suffer from asymmetric information and, thus, earn higher returns.

The rest of the paper is organized as follows. Section 2 describes our data sources, explains how we construct the attention variables, and provides descriptive summary statistics. Section 3 studies the relation between unusual patterns in attention variables and future stock returns. Section 4 examines the robustness of the empirical findings. Section 5 investigates whether empirical evidence is consistent with infomational-based or behavioral-based attention allocation theories. Section 6 explores whether empirical findings are more significant in firms where asymmetric information is more pronounced. Section 7 concludes.

2 Data

Our sample consists of the constituents of the S&P 500 that are headquartered in the U.S. The data we use to construct our attention allocation measures are downloaded from Google Insights for Search.[1] Stock prices, return, volume, market capitalization, and related variables are obtained from CRSP; accounting data and headquarters location are obtained from Compustat; state level data such as population and GDP are obtained from U.S. Census Bureau.

2.1 Aggregate Search Volume Index

We obtain aggregate search volume data from Google search engine users using Google Insights for Search. While Google Insights for Search and Google Trends (previously used database

[1] http://www.google.com/insights/search/

by Da, Engelberg, and Gao, 2010) use the same data, Insights for Search is geared towards users (such as researchers or advertisers) who may find some of its advanced features more useful for their purposes. In our specific case, we are interested in filtering search data at the national and state level, which Google Trends does not allow. Google Insights for Search uses IP address information to make an educated guess about the location where search queries originated. The data ranges from January 2004 to December 2009 and contains the monthly search volume index (SVI) for any search term. The SVI for a particular term is the query share of that term for a given location and time period, normalized by the highest query share of that term over the time-series. A web search query is the exact phrase a user types into the search engine. Query share for a particular term is the ratio between the number of queries for that term and the total number of queries at a given location and time period. In less technical terms, Google calculates the search traffic for a particular term as the number of searches for this term relative to the total number of searches in Google at a given location and time period. Google then constructs the SVI for a search term by normalizing its search traffic by the highest traffic for that term over the time-series. Hence, SVI data ranges from 0 to 100. A decrease in SVI does not necessarily imply a reduction in the absolute number of web search queries for a particular term. It essentially means that the popularity (or query share) of that particular term is decreasing.

We obtain monthly SVI data for every stock in the S&P 500 headquartered in the U.S. between January 2004 and December 2009.[2] We collect data for all stocks ever included in the index during our sample period and exclude those whose prices are below $5 (to avoid microstructure related biases), which leaves us with a total of 644 stocks.[3] Following Da, Engelberg, and Gao (2010), we collect SVI data for a stock using its ticker. If a search engine user is searching for a company ticker, it is highly likely that this user is interested in financial

[2]We focus on S&P 500 stocks and monthly data because Insights for Search only returns valid SVI data for web search queries with a significant amount of search volume.

[3]All the results are robust to using only the stocks in the S&P 500 at the beginning of each period.

information about the company.[4] Furthermore, using ticker search volume makes our sample construction less subjective than if we used the company's name. We then filter the SVI data for each company's ticker by location. Specifically, we define *national attention* as the natural logarithm of a company's ticker SVI among all search engine users in U.S., and *local attention* as the natural logarithm of a company's ticker SVI among search engine users located in the state where the company is headquartered.

2.2 Local vs. National SVI

For each given ticker, we collect local and national SVI data simultaneously. This feature of Google Insights for Search normalizes both variables by the same constant, which is the highest query share in any of the two time-series. We can then compare the relative popularity of a company's ticker between national and local investors. We define the variable *asymmetric attention* as the natural logarithm of the relative SVI between locals and nationals, or equivalently as the difference between *local attention* and *national attention.* An *asymmetric attention* larger than zero implies that local investors search information about local stocks more frequently than nonlocal investors.

Panel A in Table 1 presents the summary statistics for our *local attention, national attention* and *asymmetric attention* variables. We are able to obtain valid local SVI data for 486 stocks and national SVI data for 513 stocks. Unfortunately, as in Da, Engelberg, and Gao (2010), Insights for Search does not return valid SVI data for tickers with low search volume. This issue is exacerbated in our paper when calculating *local attention* as Insights for Search only returns data for terms that have a significant amount of search volume. We solve this obstacle by using monthly data.

The average *local attention* (3.89) is larger than the average *national attention* (3.36)

[4]Google searches for a stock ticker might be also capturing the monitoring activity of investors holding the stock. If one believes that price movements carry information, then monitoring a stock price is a way of processing information about a stock.

suggesting that investors process more information about local stocks than nonlocal stocks. Panel A also shows significant variation in SVI data for both nationals and locals. The standard deviation for *local* and *national attention* is 0.53 and 0.94, respectively. The variable *asymmetric attention* has an average of 0.43, which is statistically significantly different from zero, suggesting an endogenous local bias on attention allocation: on average, local investors search for approximately 43% more information about local stocks than nonlocal investors. The median of 0.22 reinforces the local bias, suggesting that local investors process 22% more information about local companies than nonlocal investors. The distribution of *asymmetric attention* has a statistically significant positive skew, implying that there are some stocks in the S&P 500 that attract much less interest from the average U.S. investor than from the average local investor.

The evidence from Panel A in Table 1 highlights once again that investors process more information about local stocks than nonlocal investors, providing additional support to the large and growing literature studying the importance of geography in finance (Bae, Stulz, and Tan, 2008; Coval and Moskowitz, 1999, 2001; Ivkovic and Weisbenner, 2005; Malloy, 2005; Portes and Rey, 2005). These projects conjectured that investors have access to local private information and analyzed the role of geography in different finance settings. Our results not only suggest that investors have exogenous local private information, but also that investors endogenously choose to process more public information about local firms. It is difficult to argue that this evidence can be explained by differences in relative information acquisition costs of locals and nonlocals since all information is publicly available.

Panel B in Table 1 presents the relation of our *asymmetric attention* variable with the following firm characteristics: *i*) ME is the market capitalization in the previous month $(t-1)$; *ii*) BE/ME is the book-to-market value of equity, where the book value, calculated according to Davis, Fama, and French (2000), is divided by the previous month's market capitalization; *iii*) RET is the return of the stock during the month; *iv*) RET[t-13,t-2] is the cumulative return of the stock between months t-13 and t-2; *v*) AMIHUD is the liquidity measure constructed according to Amihud (2002); *vi*) SPREAD is the proportional quoted bid-ask spread; *vii*) VOLATILITY is the standard deviation of the daily stock returns in the current month; *viii*) ΔTURNOVER is the difference in the natural logarithm of stock turnover between t and $t-1$. Each month, we divide our sample into five quintiles according to the *asymmetric attention* variable, where the first quintile consists of stocks with the lowest *asymmetric attention*. Firms in the first quintile of *asymmetric attention* are those with relatively high national interest, while firms in the fifth quintile exhibit relatively high local interest. We then calculate the averages of the firm characteristics for each of the five quintiles. The average *asymmetric attention* for firms with large national interest (first quintile) and firms with large local interest (fifth quintile) is -0.31 and 1.63, respectively. We expected small firms to have higher local interest, but there is no relation between size and *asymmetric attention.* A potential explanation might be that big firms have more employees who hold local stocks. It is also interesting to note that firms with higher cumulative returns (RET[t-13,t-2]) have less asymmetry between local and national SVI. The Amihud illiquidity measure is monotonically increasing with *asymmetric attention.* Firms with large national interest tend to be more liquid than firms with high local interest. However, there is no clear relationship of volatility, spreads, turnover or book-to-market ratio with respect to *asymmetric attention.*

2.3 Local vs. National Abnormal SVI

After presenting evidence suggesting the presence of a local bias in the attention allocated to stocks, we examine whether unusual patterns in attention allocation have asset pricing implications. We measure unusual search volume using the abnormal SVI (ASVI) of a ticker. Following Da, Engelberg, and Gao (2010), ASVI is defined as the natural logarithm of the SVI during the current month subtracted by the natural logarithm of the median SVI during the previous quarter (previous three months).[5] Then, we measure *abnormal national attention* as the ASVI of a company's ticker from all users located in U.S. and *abnormal local attention* as the ASVI of a company's ticker filtered by searches located in the state where the company is headquartered. Finally, we measure *abnormal asymmetric attention* as the relative ASVI of local versus nonlocal investors, that is, the difference between *abnormal local attention* and *abnormal national attention*. In sum, abnormal attention is proxied by unusual search volume relative to the previous quarter.[6]

Panel A in Table 2 presents the summary statistics for our *abnormal local attention, abnormal national attention*, and *abnormal asymmetric attention* variables. The mean and median of these variables are around zero. These measures also have significant variation: the standard deviation of *abnormal local attention, abnormal national attention,* and *abnormal asymmetric attention* are 0.25, 0.21, and 0.21, respectively.

Panel B in Table 2 exhibits the relation of our *abnormal asymmetric attention* variable to several firm characteristics. Each month, we divide our sample into five quintiles according to the *abnormal asymmetric attention* variable, where the first quintile consists of stocks with the lowest *abnormal asymmetric attention*. Stocks in the first quintile are experiencing abnormal increases in the attention allocated by the average U.S. investor, while stocks in the fifth quintile are experiencing abnormal increases in the attention allocated by local investors. From the univariate analysis, we can observe that there is no monotonic relation between *abnormal asymmetric attention* and any relevant firm characteristic.

3 Attention and Stock Returns

In this section we investigate whether stocks which have an abnormal pattern of national, local and/or asymmetric attention earn higher future returns.

[5] Note that ASVI does not depend on the normalizing constant introduced by Google when reporting SVI.
[6] All our results are robust to alternative specifications of ASVI.

We use three different approaches to investigate the relationship between abnormal SVI and future stock returns. First, we run Fama and MacBeth (1973) cross-sectional regressions. Then, we use panel regressions, in which we include time and firm fixed effects and cluster-robust standard errors to control for unobserved heterogeneity. Lastly, we form long-short portfolios sorted by abnormal attention.

3.1 Cross-sectional Regressions

We first study the relation between abnormal SVI and future stock returns for the S&P 500 stocks included in our sample. We run Fama and MacBeth (1973) cross-sectional regressions each month from January 2004 to December 2009. These results are reported in Table 3. The dependent variable is the DGTW characteristic-adjusted abnormal returns from month $t+1$. The DGTW abnormal returns are constructed using the method developed by Daniel, Grinblatt, Titman, and Wermers (1997).[7] All regressions control for the following previously defined firm characteristics: log(ME) is the natural logarithm of the market capitalization in month t; log(BE/ME) is the natural logarithm of the book-to-market value of equity, where book value, calculated according to Davis, Fama, and French (2000), is divided by the previous month market capitalization; RET is the return of the stock during month t; RET[t-13,t-2] is the cumulative return of the stock between $t-13$ and $t-2$; AMIHUD is the liquidity measure constructed according to Amihud (2002) from month t; SPREAD is the proportional quoted bid-ask spread in month t; VOLATILITY is the standard deviation of the daily stock returns of the current month t; ΔTURNOVER is the difference in the natural logarithm of stock turnover between t and $t-1$.

In the first regression of Table 3, we replicate the results from Da, Engelberg, and Gao (2010) at the monthly frequency. We use *abnormal national attention* as the independent variable. We find no evidence of an empirical relation between *abnormal national attention* and future

[7] Our results are robust to the use of future raw stock excess returns instead of future DGTW abnormal stock returns.

DGTW abnormal stock returns. Da, Engelberg, and Gao (2010) argued that *abnormal national attention* has an effect in the first two weeks of the month, which is then reversed in the future. In the second regression, we study the relation between stock returns and *abnormal asymmetric attention.* The *abnormal asymmetric attention* coefficient is economically and statistically significant. A one standard deviation increase in *abnormal asymmetric attention* is associated with an increase in the next-month DGTW abnormal stock return of 13.1 bps. Another way to quantify the economic significance of the *abnormal asymmetric attention* coefficient is to obtain the difference between the first and fifth quintile of *abnormal asymmetric attention* from Panel B in Table 2 and multiply it by the regression coefficient. Everything else equal, observations with high *abnormal asymmetric attention* earn future DGTW abnormal stock returns that are 34.6 bps higher than observations with low *abnormal asymmetric attention*. We will show in the following sections that the relation between *abnormal asymmetric attention* and future stock returns is robust to different statistical approaches.

The significant effect of *abnormal asymmetric attention* is obtained after controlling for firm characteristics that previous studies found to affect stock returns. We find positive effects of book-to-market ratio and of the Amihud (2002) illiquidity measure on future stock returns.

3.2 Panel Regressions

In this section, we analyze the relation between abnormal SVI and future returns for the S&P 500 stocks using panel regressions. The dependent variable in all regressions is again the DGTW characteristic-adjusted abnormal returns from month $t + 1$. We also control for the same firm characteristics as in the previous section. The results are reported in the third and fourth regressions of Table 3.

We include monthly and firm fixed effects and report White standard errors adjusted to account for possible correlation within firms in all panel regressions. In the third regression of Table 3, we show again that there is no effect of *abnormal national attention* on future stock returns at the monthly frequency. In the fourth regression, we use *abnormal asymmetric attention* as the independent variable and find its coefficient to be statistically and economically significant. According to panel regressions, a one standard deviation increase in *abnormal asymmetric attention* is associated with an increase in the next-month DGTW abnormal stock returns of 16.7 bps. Also, everything else equal, the difference in future DGTW abnormal stock returns between observations with high and low *abnormal asymmetric attention* is 44.1 bps.

All panel regressions control for firm characteristics. We find a significant negative effect of size and positive effects of book-to-market ratio, cumulative return, and the Amihud (2002) illiquidity measure on future stock returns.

3.3 Long-Short Portfolios

We now examine the relationship between *abnormal asymmetric attention* and future returns of equal- and value-weighted portfolios formed using S&P 500 stocks. Each month, we sort stocks based on their relative ASVI. We then form three different portfolios: *i*) *high-asymmetry* portfolio consists of stocks that in a given month have relative ASVI above the 80th percentile; *ii*) *no-asymmetry* portfolio consists of stocks that in a given month are not included in the *high-asymmetry* portfolio; *iii*) *long-short* portfolio is a zero-investment portfolio that in a given month longs *high-asymmetry* stocks and shorts *no-asymmetry* stocks. We form and calculate the following-month's return for each of these three portfolios in every month. We then regress the time-series returns on the five-factor model, which includes three factors from Fama and French (1993), the momentum factor from Carhart (1997), and the liquidity factor from Pastor and Stambaugh (2003). The market portfolio, size factor, book-to-market factor, momentum factor, and liquidity factor are all downloaded from WRDS. We will conclude that the difference in returns between the *high-* and *no-asymmetry* portfolios is significant if the estimated alpha of the *long-short* portfolio is statistically and economically significant. In Table 4, we report both equal- and value-weighted next-month excess returns over the risk free rate for each of the three portfolios. For robustness, we also report the following-month DGTW abnormal returns for each portfolio.

Panel A in Table 4 presents the factor loadings and Jensen's alpha for the equal- and value-weighted returns of all stocks in the S&P 500 over our sample period. As demonstrated by Cremers, Petajisto, and Zitzewitz (2010), the five factor model generates economically and statistically significant Jensen's alphas for the S&P 500 when using equal-weighted returns. We obtain a Jensen's alpha of 0.30 in our sample when using equal-weighted excess returns. We find, however, no significant alpha when using raw value-weighted returns. If we calculate the alphas for the 486 stocks for which we have local SVI data in our sample period, we get very similar results for both equal- and value-weighted returns.

Panel B exhibits the alphas for the three portfolios sorted by *abnormal asymmetric attention*. As expected from Panel A, our *high-* and *no-asymmetry* portfolios have a significant positive alpha when using equal-weighted returns. The *high-asymmetry* portfolio experienced an average of 0.64% following-month excess return, while the *no-asymmetry* portfolio had an average of 0.21% following-month excess return. The *long-short* portfolio shows a 42 bps difference between the *high-* and *no-asymmetry* portfolios that is statistically and economically significant when using equal-weighted excess returns. In contrast, the *no-asymmetry* portfolio exhibits no significant alpha when using value-weighted returns, while the *high-asymmetry* portfolio obtains a 0.47% average next-month excess return. The *long-short* portfolio produces a 46 bps next-month return that is statistically and economically significant. Regarding risk-adjusted returns, the *no-asymmetry, high-asymmetry*, and *long-short* portfolios obtain statistically significant alphas of 0.15 bps, 0.40 bps, and 0.25 bps, respectively, when using equal-weighted DGTW returns. Similarly, we get alphas of -0.01 bps, 0.36 bps, and 0.37 bps for all three portfolios, respectively, when using value-weighted DGTW returns. The difference in magnitude for equal-weighted and value weighted returns between the *high-asymmetry* and *no-asymmetry* portfolios is similar to those obtained under panel and cross-section regressions.

In sum, the previous three sections present empirical evidence supporting a robust relationship between *abnormal asymmetric attention* and future returns for the S&P 500 stocks. Stocks which attract an abnormal amount of attention from local relative to nonlocal investors earn higher future returns.

4 Robustness

4.1 State Characteristics

We now examine the robustness of our regressions to the inclusion of characteristics of the states in which firms are headquartered. The motivation is to check whether our results are driven by a small group of stocks which are headquartered in a particular state. In Table 5, we introduce additional variables that aim to control for state fixed effects and state characteristics. In the first column, we run panel regressions that include firm, time and state fixed effects and cluster standard errors around state, which account for possible correlation within state. We also introduce state characteristics such as GDP per capita, to control for more developed states, and population, to control for the size of the state. We find that GDP per capita is negative and statistically significant, population size is statistically insignificant, and, more importantly, the magnitude and significance of the coefficient associated to *abnormal asymmetric attention* remains unchanged with respect to previous specifications. In the second regression, we report coefficients estimated using the Fama and MacBeth (1973) method, also including state fixed effects, state GDP per capita, and state population size. The magnitude and significance of the coefficient for *abnormal asymmetric attention* are similar to the one reported in Table 3. In sum, the results are robust to state fixed effects and state characteristics for both cross-sectional and panel regressions.

4.2 Industry Effects

We also check the robustness of our results to industry effects. Hou and Robinson (2006) report a relation between industry concentration and stock returns. In the third regression of Table 5, we run a panel regression with firm, monthly, and industry fixed effects and cluster standard errors around industries, which account for possible correlation within industry. We define each industry using 2-digit SIC codes. We could potentially use more SIC digits to define an industry but, since we have few firms, increasing the number of digits would essentially control for firm fixed effects (a robustness check which we have already reported). The magnitude and significance of the *abnormal asymmetric attention* coefficient remains unaltered with respect to results reported in Table 3. In the fourth regression, we report the Fama and MacBeth (1973) regression with industry fixed effects. The magnitude and significance of the coefficient for *abnormal asymmetric attention* are, once again, similar to the one reported in Table 3.

4.3 Alternative Measure of Returns

In the fifth regression of Table 5, we show that our main result in Table 3 is robust to the use of future raw stock returns instead of future DGTW abnormal stock returns. We use next-month raw stock returns as the dependent variable and *abnormal asymmetric attention* as the independent variable. We find that our coefficient for *abnormal asymmetric attention* is also statistically and economically significant.

5 Attention Allocation Theories

This section investigates whether empirical evidence is consistent with infomational-based or behavioral-based attention allocation theories.

5.1 Informational-Based Attention Allocation

Informational-based attention allocation theories such as van Nieuwerburgh and Veldkamp (2009, 2010) and Mondria and Wu (2010) recently rationalized why investors hold under-diversified portfolios. In their frameworks, investors face an attention allocation decision before choosing their asset holdings. Specifically, investors may choose whether they want to learn more information about local or nonlocal stocks. Assuming investors have a small exogenous informational advantage which makes local investment slightly less risky, the authors show that investors will optimally choose to process information mostly about local assets and, compared to the market portfolio, hold a greater proportion of these assets. In other words, portfolios are locally biased not only because of exogenous asymmetries (for instance, local information is cheaper or locals are endowed with better information regarding local businesses), but also because investors choose to allocate more attention to local stocks, which endogenously amplify the small initial asymmetry. These theories also have asset pricing implications.

Under these theories, the arrival of private news about local companies leads investors to start processing more public information about these local firms. Everything else equal, the information asymmetry between local and nonlocal investors is endogenously magnified. Consequently, there is an increase in the buying pressure by locals that leads, on average, to an increase in the holdings and price of the stock.[8] We would like to emphasize that the theory predicts that an increase in asymmetric attention about a stock leads to an increase in the unconditional expectation of the stock price. The reason is that more information about a stock reduces the conditional variance, increases the expected demand and, thus, increases the expected price of that stock.

The empirical implication of informational-based models of attention is that one can infer the arrival of unobservable private information to locals by observing investors' attention

[8]Under informational-based theories of attention allocation, more attention allocated to a stock translates into an increase in the unconditional expectation of the stock price because of mean-variance preferences.

allocation behavior. According to these theories, if we observed local investors processing more public information about local stocks relative to nonlocal investors, this would imply that local investors received private information and that stock prices will increase. We interpret an increase in *abnormal asymmetric attention* as a proxy for the rise in the amount of public information – which is endogenously processed after the arrival of private news – by local relative to nonlocal investors who are considering buying the stock.[9] This implies that an increase in the *abnormal asymmetric attention* received by a stock will tend to be associated to an increase in the buying pressure from local investors and, as a result, higher returns should be observed. To support these theories, one should be able to show that firms attracting abnormally high asymmetric attention earn higher future returns.

Our findings in Tables 3 and 4 are consistent with informational-based attention allocation theories.

5.2 Behavioral-Based Attention Allocation

Behavioral-based attention allocation explanations such as Barber and Odean (2008) and Da, Engelberg, and Gao (2010) argue that limited attention affects asset prices because investors have a large set of available assets when making buying decisions. This implies that when investors choose to allocate attention to stocks, there will be an increase in the buying pressure that leads, on average, to an increase in the holdings and price of the stock.

The empirical implication of these theories is that if we observed investors processing more public information about a stock, this would imply that this particular stock grabbed the attention of investors and its stock price should increase. We interpret an increase in *abnormal national attention* as a proxy for the rise in the amount of public information processed by investors who are considering buying the stock. This implies that an increase in the *abnormal national attention* received by a stock will tend to be associated to an increase in the buying

[9] Following the literature on finance and geography, we are implicitly assuming that investors have an initial exogenous information advantage about local stocks.

pressure from investors and, as a result, higher returns should be observed. To support these theories, one should be able to show that firms with either high *abnormal national attention* earn higher future returns.

Results in Table 3 are not consistent with this explanation. Specifically, it confirms the results by Da, Engelberg, and Gao (2010) at the monthly frequency. They show that behavioral-based attention allocation theories affect asset prices for the following two weeks after the attention-grabbing event, which is then reversed in the future.

One might wonder, however, whether it is the attention allocated just by locals which is driving the results as opposed to *abnormal asymmetric attention*. If this were the case, it would be consistent with a behavioral-based theory of attention allocation. If we interpreted an increase in *abnormal local attention* as a proxy for the rise in the amount of public information processed by local investors who are considering buying a local stock, this would imply that this particular stock grabbed the attention of local investors and its stock price should increase.

In order to test this alternative hypothesis, we now examine the relationship between *abnormal local attention* and future returns of equal- and value-weighted portfolios.

Panel C in Table 4 presents Jensen's alphas for three portfolios sorted by *abnormal local attention*. The *high-local* portfolio includes stocks that have a local ASVI above the 80th percentile in a given month, while the *no-local* portfolio includes those below the 80th percentile. The *long-short-local* portfolio is constructed by having a long position in *high-local* stocks and short position in *no-local* stocks. We then calculate the following-month's returns for each of these three portfolios. Under equal-weighted excess returns, the *high-local* portfolio experienced an average 0.57% following-month excess return, while the *no-asymmetry* portfolio had an average 0.23% following-month excess return. However, the *long-short* portfolio has an alpha that is not statistically different from zero. Under value-weighted returns, none of the portfolios produces a Jensen's alpha statistically different from zero. The results for risk-adjusted returns are similar to those with raw excess returns.

Our results suggest that it is neither high *abnormal national attention* nor high *abnormal local attention* that is associated with firms earning higher future returns, but the difference between *abnormal local attention* and *abnormal national attention*. Thus, our results are not consistent with behavioral-based attention allocation theories. One potential explanation for this finding relies in the data frequency. The empirical evidence supporting behavioral-based models of attention allocation is mostly based on daily and weekly data.

6 Information frictions

Informational-based models of attention allocation rely on investors having an initial information advantage or investors believing they have an information advantage. Under both scenarios, investors will process public information about local stocks, which drives their prices up. Hence, the main assumption in the informational-based models of attention allocation is the investors' belief that there is a local information advantage. This assumption can be justified on several grounds: i) the existence of asymmetric information at the local level has been extensively discussed by the literature on geography and finance, which argues that investors are better informed about local assets; ii) behavioral explanations such as local distraction bias in which local investors read local newspapers, listen to local radio stations and watch local TV channels might lead to the existence of asymmetric information; iii) over-confidence on the precision of local information could lead investors to believe they have a local information advantage (even if it turns out this information advantage does not exist); iv) local media is positively on average biased towards local stocks. We would like to emphasize that it is the belief in the existence of a local information advantage that drives the attention allocation choice.

Next, we examine whether the abnormal return associated to *abnormal asymmetric attention* is arising from information frictions as informational-based models of attention allocation suggest. According to these theories, we should observe a more pronounced effect of *abnormal asymmetric attention* for stocks headquartered in places where local information is more valuable and difficult to acquire for nonlocals.

We investigate our information frictions conjecture by double sorting stocks first by their geographical location relative to a metropolitan area, and then by *abnormal asymmetric attention.* Following, Coval and Moskowitz (2001) and Malloy (2005), we define *remote* location as the minimum distance between the city where the stock is headquartered and the 21 most populated cities in the U.S. We use 21 cities, rather than 20 as in previous literature, because in 2009 Boston replaced Baltimore as the 20th most populated city. We obtain data on population by city from the U.S. Census Bureau. We then find latitude and longitude data for the headquarters of all stocks in our sample and the 21 most populated cities from the U.S. Census Bureau's Gazetteer Files. We finally calculate the minimum distance (arc length) between all stocks' headquarters and the 21 most populated cities to construct our *remote* location variable. Our information frictions hypothesis will hold if the return differential between the *high-* and *no-asymmetry* portfolios is more pronounced for stocks located in more remote places.

Each month, we sort stocks into quintiles based on *remote* location. Then, for each quintile, we form three portfolios sorted by relative ASVI: a *high-asymmetry* portfolio, a *no-asymmetry* portfolio and a *long-short* portfolio. We calculate following-period returns for each portfolio for every remote location quintile and every month. In Table 6, we report both equal- and value-weighted following-month excess returns over the risk free rate for the three portfolios sorted by *abnormal asymmetric attention* for stocks in the first and fifth *remote* location quintiles. For robustness, we also report the next-month DGTW abnormal returns for each portfolio.

Table 6 provides evidence in support of our information frictions conjecture. The *abnormal asymmetric attention* effect is more evident for stocks located in more *remote* locations where private local information is more valuable. The *abnormal asymmetric attention* effect is weak for stocks in the first *remote* quintile, which essentially includes stocks located in the 21 most populated cities, where private information is difficult to survive. Jensen's alpha from *high-asymmetry* portfolios are always larger than their *no-asymmetry* portfolio counterparts for both equal- and value-weighted returns. However, the *long-short* portfolio alpha is not statistically significant for stocks located in metropolitan areas. For stocks located in *remote* locations, we find economically and statistically significant alphas in the *long-short* portfolio for both raw and DGTW abnormal using both equal- or value-weighted returns. For instance, for the value-weighted raw excess returns case, we find an alpha of 82 bps for the *long-short* portfolio.

An alternative measure of information frictions is liquidity. As argued by Frieder and Subrahmanyam (2005) and Loughran and Schultz (2005), information frictions are a major determinant of liquidity. Hence, we can also investigate our information frictions hypothesis using the Amihud (2002)'s liquidity measure. We test our hypotheses by double sorting stocks first according to the Amihud's liquidity measure and then by *abnormal asymmetric attention.* Our information frictions hypothesis will hold if the return differential between the *high-* and *no-asymmetry* portfolios is more pronounced for illiquid stocks

Each month, we sort stocks into quintiles based on the Amihud measure. For each of these liquidity quintiles, we form three portfolios sorted by relative ASVI. Specifically, we form a *high-asymmetry* portfolio, a *no-asymmetry* portfolio, and a *long-short* portfolio as detailed in the previous section. We then calculate the following-period return of each portfolio for every liquidity quintile and every month. Table 7 reports both equal- and value-weighted following-month excess returns over the risk free rate for all three portfolios sorted by *abnormal asymmetric attention* for stocks in the first and fifth liquidity quintiles. For robustness, we also report the following-month DGTW abnormal returns for each portfolio.

Table 7 reveals that for liquid stocks, the alpha of the *high-asymmetry* portfolio is 57 bps higher than that of the *no-asymmetry* portfolio when we use equal-weighted excess returns.

The alpha of the *long-short* portfolio is, however, not statistically significantly different from zero. For illiquid stocks, the alpha for the *high-asymmetry* portfolio is 70 bps higher than the one for the *no-asymmetry* portfolio. Additionally, the alpha of the *long-short* portfolio is economically and statistically significant. We reach a similar conclusion if we use value-weighted excess returns or if we focus on risk-adjusted returns instead.

Following Fang and Peress (2009) and Garcia and Norli (2012), the results in Table 7 also imply that the effects generated by *abnormal asymmetric attention* are persistent due to liquidity reasons. However, this interpretation must be taken with caution as our analysis is based only on S&P 500 stocks, which are highly liquid.

Overall, Tables 6 and 7 exhibit evidence in support of the information frictions hypothesis as an explanation to the *abnormal asymmetric attention* effect documented in this paper.

It is important to highlight that our results are not only driven by the presence of information frictions, but also by the endogenous amplification of asymmetric information which results from the existence of such frictions. Coval and Moskowitz (2001) and Ivkovic and Weisbenner (2005) focused on the presence of information frictions and argue that firms headquartered in more remote areas suffer from more asymmetric information. In our analysis, we are able to infer the arrival of private information to local investors by observing investors' attention allocation behavior. Specifically, we are able to form portfolios by stock and month based on asymmetric attention to predict when stocks in remote areas will actually earn higher returns.

7 Conclusion

In this paper, we find empirical evidence that stocks earn higher returns when they attract abnormally high asymmetric attention from local investors relative to their nonlocal counterparts. Specifically, portfolios consisting of stocks with high abnormal asymmetric attention obtain following-month returns which are 46 bps higher than portfolios formed with stocks with no abnormal asymmetric attention. Moreover, we provide evidence suggesting that the asymmetric attention effect exists due to the presence of local information frictions. Our results are consistent with van Nieuwerburgh and Veldkamp (2009, 2010) and Mondria and Wu (2010), where investors endogenously process more public information about local stocks when they receive exogenous private news.

As implied by Coval and Moskowitz (2001), if we form portfolios sorted by the geographical location of each stock's headquarter, we should obtain higher returns for stocks in more remote areas due to the presence of information frictions. With the construction of a variable which captures asymmetric patterns on endogenous information processing, our paper predicts whether and when stocks located in remote areas will actually earn higher returns. In particular, portfolios sorted by abnormal asymmetric attention tend to obtain statistically and economically significant alphas for stocks located in remote areas.

Unfortunately, we are not able to increase the sample size of this study to include other stocks due to lack of SVI data at the local level for stocks outside the S&P 500. We conjecture that the asymmetric attention effect will increase in its magnitude because S&P 500 stocks are widely followed at the national level.

We hope to encourage more work exploring attention allocation theories in the future. Previous work has focused on the existence of information asymmetries to tackle many finance and macroeconomic topics. Informational-based attention allocation theories allow us to predict the arrival of private information by observing investors' behavior. Thus, given that we can infer the arrival of private news at any moment in time, we can now provide more accurate evidence in favor or against asymmetric information as the explanation to many puzzles.

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Table 1: Summary Statistics and Quintiles by Asymmetric Attention

PANEL A: Descriptive Statistics						
	No. Stocks	Mean	Std. Dev.	Min.	Median	Max.
National attention	513	3.36	0.94	0	3.61	4.61
Local attention	486	3.89	0.53	0	4.02	4.61
Asymmetric attention	486	0.43	0.74	-3.12	0.22	4.39

PANEL B: Averages by Asymmetric Attention (Relative SVI) Quintiles					
	Q1	Q2	Q3	Q4	Q5
Asymmetric attention	-0.31	0.03	0.23	0.60	1.63
ME	18,752	21,997	20,452	29,216	25,705
BE/ME	0.50	0.58	0.57	0.48	0.45
RET	0.88	1.04	0.74	0.62	0.80
RET[t-13,t-2]	10.80	9.90	5.04	5.55	5.17
AMIHUD	0.014	0.025	0.029	0.184	0.221
SPREAD	0.133	0.146	0.137	0.127	0.111
VOLATILITY	2.29	2.3	2.33	2.47	2.26
ΔTURNOVER	0.006	0.001	0.013	0.017	0.004

Note: Search volume index (SVI) of a company is the aggregate search volume for the company’s ticker obtained from Google Insights for Search. *National attention* is the natural logarithm of a company's ticker SVI among all search engine users in U.S. *Local attention* is the natural logarithm of a company's ticker SVI among search engine users located in the state where the company is headquartered. *Asymmetric attention* is the difference between *local attention* and national attention. Panel A presents the summary statistics for *national attention*, *local attention*, and *asymmetric attention*. Panel B presents the relation of our *asymmetric attention* variable to the following firm characteristics: i) ME is the market capitalization in the previous month (t-1); ii) BE/ME is the book-to-market value of equity, where the book value, which is calculated according to Davis, Fama, and French (2000), is divided by the previous month market capitalization; iii) RET is the return of the stock during the month; iv) RET[t-13,t-2] is the cumulative return of the stock between t-13 and t-2; v) AMIHUD is the liquidity measure constructed according Amihud (2002); vi) SPREAD is the proportional quoted bid-ask spread; vii) VOLATILITY is the standard deviation of the daily stock returns of the current month; viii) ΔTURNOVER is the difference in the natural logarithm of stock turnover between t and t-1. Each month, the sample is divided into five quintiles according to the asymmetric searches variable, where the first quintile consists of stocks with the lowest asymmetric searches. Panel B reports the averages of the firm characteristics for each of the five quintiles.

Table 2: Summary Statistics and Quintiles by Abnormal Asymmetric Attention

PANEL A: Descriptive Statistics					
	Mean	Std. Dev.	Min.	Median	Max.
Abnormal national attention	0.007	0.21	-3.93	0	2.71
Abnormal local attention	0.000	0.25	-3.61	0	2.52
Abnormal asymmetric attention	-0.009	0.21	-2.54	-0.002	3.21

PANEL B: Averages by Abnormal Asymmetric Attention (Relative ASVI) Quintiles					
	Q1	Q2	Q3	Q4	Q5
Abnormal asymmetric attention	-0.291	-0.077	-0.004	0.067	0.262
ME	19,442	25,612	27,079	24,528	20,188
BE/ME	0.54	0.50	0.52	0.50	0.56
RET	0.75	0.59	0.78	1.09	0.67
RET[t-13,t-2]	7.17	6.44	6.04	6.32	6.00
AMIHUD	0.155	0.097	0.035	0.082	0.119
SPREAD	0.121	0.128	0.132	0.148	0.134
VOLATILITY	2.36	2.26	2.36	2.36	2.42
ΔTURNOVER	0.000	-0.003	0.006	0.014	0.013

Note: Search volume index (SVI) of a company is the aggregate search volume for the company's ticker obtained from Google Insights for Search. We define abnormal search volume index (ASVI) as the natural logarithm of SVI during the current month minus the natural logarithm of the median SVI during the previous quarter (previous three months). *Abnormal national attention* is the natural logarithm of a company's ticker ASVI among all search engine users in U.S. *Abnormal local attention* is the natural logarithm of a company's ticker ASVI among search engine users located in the state where the company is headquartered. *Abnormal asymmetric attention* is the difference between *abnormal local attention* and *abnormal national attention*. Panel A presents the summary statistics for *abnormal national attention*, *abnormal local attention*, and *abnormal asymmetric attention*. Panel B exhibits the relation of our *abnormal asymmetric attention* variable to the following firm characteristics: i) ME is the market capitalization in the previous month (t-1); ii) BE/ME is the book-to-market value of equity, where the book value, which is calculated according to Davis, Fama, and French (2000), is divided by the previous month market capitalization; iii) RET is the return of the stock during the month; iv) RET[t-13,t-2] is the cumulative return of the stock between t-13 and t-2; v) AMIHUD is the liquidity measure constructed according Amihud (2002); vi) SPREAD is the proportional quoted bid-ask spread; vii) VOLATILITY is the standard deviation of the daily stock returns of the current month; viii) ΔTURNOVER is the difference in the natural logarithm of stock turnover between t and t-1. Each month, we divide our sample in five quintiles according to the asymmetric attention variable, where the first quintile consists of stocks with the lowest asymmetric attention. Panel B reports the averages of the firm characteristics for each of the five quintiles.

Table 3: Abnormal Asymmetric Attention and Stock Returns

Month	t+1	t+1	t+1	t+1
Regression	(1)	(2)	(3)	(4)
Abnormal national attention	-0.247		-0.164	
	(0.347)		(0.273)	
Abnormal asymmetric attention		0.625**		0.797**
		(0.278)		(0.318)
log(ME)	-0.091*	-0.071	-3.108***	-3.410***
	(0.047)	(0.047)	(0.309)	(0.387)
log(BE/ME)	0.116	0.175**	1.599***	1.702***
	(0.075)	(0.085)	(0.180)	(0.211)
RET	0.015	0.019	0.008	0.011
	(0.014)	(0.014)	(0.008)	(0.009)
RET[t-13,t-2]	-0.003	-0.001	0.005**	0.005*
	(0.007)	(0.007)	(0.002)	(0.003)
AMIHUD	0.179	0.590*	0.027***	0.061***
	(0.146)	(0.321)	(0.004)	(0.004)
SPREAD	0.652	0.610	-0.067	0.033
	(0.667)	(0.761)	(0.168)	(0.132)
VOLATILITY	0.056	0.047	-0.104	-0.139
	(0.170)	(0.180)	(0.100)	(0.112)
ΔTURNOVER	0.080	0.120	0.057	0.047
	(0.160)	(0.171)	(0.101)	(0.101)
Estimation procedure	FMB	FMB	OLS	OLS
Clustered standard errors?	no	no	by firms	by firms
Fixed effects?	no	no	monthly and firm	monthly and firm
R-Squared	0.0683	0.0782	0.0285	0.0333

Note: Monthly Fama-MacBeth (1973) (FMB) and Panel (OLS) regressions from January 2004 to December 2009. Dependent variable is the DGTW characteristic-adjusted abnormal returns evaluated at month t+1. *Abnormal national attention* is the natural logarithm of a company's ticker ASVI among all search engine users in U.S. *Abnormal local attention* is the natural logarithm of a company's ticker ASVI among search engine users located in the state where the company is headquartered. *Abnormal asymmetric attention* is the difference between *abnormal local attention* and *abnormal national attention*. All attention related variables are calculated for month t. All regressions control for the following firm characteristics: log(ME) is the natural logarithm of the market capitalization in month t; log(BE/ME) is the natural logarithm of the book-to-market value of equity, where the book value, which is calculated according to Davis, Fama, and French (2000), is divided by the previous month market capitalization; RET is the return of the stock during month t; RET[t-13,t-2] is the cumulative return of the stock between t-13 and t-2; AMIHUD is the liquidity measure constructed according to Amihud (2002) from month t; SPREAD is the proportional quoted bid-ask spread in month t; VOLATILITY is the standard deviation of the daily stock returns of the current month t; ΔTURNOVER is the difference in the natural logarithm of stock turnover between t and t-1. The third and fourth equations control for time and firm fixed effects. The symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 4: Excess Return on Portfolios Sorted by Abnormal Asymmetric Attention

PANEL A: Factor Loadings and Jensen's Alpha for S&P 500 Constituents

		Alpha	Mkt-Rf	SMB	HML	MOM	LIQ
All Firms	EW Excess Returns	0.30***	1.06***	0.23***	0.04	-0.14***	1.04
		(0.07)	(0.03)	(0.04)	(0.04)	(0.02)	(2.91)
	VW Excess Returns	0.03	0.95***	-0.11***	0.01	-0.03	-5.05***
		(0.05)	(0.02)	(0.02)	(0.03)	(0.02)	(1.48)
Firms with Local SVI	EW Excess Returns	0.30***	1.05***	0.29***	0.05	-0.11***	3.10
		(0.09)	(0.03)	(0.05)	(0.05)	(0.03)	(3.54)
	VW Excess Returns	0.09	0.95***	-0.14***	-0.00	0.03	-4.60*
		(0.07)	(0.02)	(0.03)	(0.04)	(0.02)	(2.45)

PANEL B: Excess Return on Portfolios Sorted by Abnormal Asymmetric Attention

	Raw Returns			Risk-Adjusted Returns		
	No-asym	High-asym	High-No	No-asym	High-asym	High-No
EW Excess Returns	0.21**	0.64***	0.42***	0.15*	0.40***	0.25*
	(0.09)	(0.17)	(0.14)	(0.08)	(0.12)	(0.13)
VW Excess Returns	0.01	0.47**	0.46**	-0.01	0.36**	0.37**
	(0.07)	(0.18)	(0.22)	(0.04)	(0.14)	(0.16)

PANEL C: Excess Return on Portfolios Sorted by Abnormal Local Attention

	Raw Returns			Risk-Adjusted Returns		
	No-local	High-local	High-No	No-local	High-local	High-No
EW Excess Returns	0.23**	0.57**	0.34	0.16**	0.38**	0.22
	(0.09)	(0.25)	(0.26)	(0.08)	(0.18)	(0.20)
VW Excess Returns	0.04	0.20	0.15	0.03	0.21	0.18
	(0.09)	(0.20)	(0.26)	(0.05)	(0.17)	(0.19)

Note: Jensen's alphas for portfolios sorted by *abnormal asymmetric attention* and portfolios sorted by *abnormal local attention*. *Abnormal local attention* is the ASVI to the company's ticker filtered by searches located in the state where the company is headquartered. *Abnormal asymmetric attention* is the difference between *local abnormal attention* and *national abnormal attention*. Panel A presents the factor loadings and Jensen's alpha for the equal-weighted and value-weighted returns of all stocks. Panel B exhibits the alphas for the three portfolios sorted by *abnormal asymmetric attention*. Each month, we form three different portfolios: i) high-asymmetry portfolio consists of stocks with Relative ASVI above the 80th percentile; ii) no-asymmetry portfolio consists of stocks that are not included in the high-asymmetry portfolio; iii) long-short portfolio is a zero-investment portfolio that longs high-asymmetry stocks and shorts no-asymmetry stocks. We calculate the following-month excess return over the risk free rate for each portfolio and regress the time-series excess returns on the five-factor model that includes the three Fama and French factors, the momentum factor and the liquidity factor. We also report the alphas when we calculate the next-month DGTW abnormal returns for each portfolio. Panel C presents the Jensen's alphas for three portfolios sorted by *abnormal local attention*. The symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 5: Abnormal Asymmetric Attention and Stock Returns – Robustness

Month	t+1	t+1	t+1	t+1	t+1
Regression	(1)	(2)	(3)	(4)	(5)
Abnormal asymmetric attention	0.796**	0.585*	0.797**	0.591**	0.573**
	(0.302)	(0.327)	(0.341)	(0.254)	(0.261)
log(ME)	-2.489***	0.026	-3.410***	-0.020	-0.194**
	(0.458)	(0.052)	(0.452)	(0.057)	(0.092)
log(BE/ME)	1.594***	0.150*	1.702**	0.126	0.178*
	(0.236)	(0.087)	(0.284)	(0.109)	(0.100)
RET	0.011	0.029*	0.011	0.013	0.025
	(0.010)	(0.015)	(0.010)	(0.012)	(0.017)
RET[t-13,t-2]	0.003	0.006	0.005	-0.002	-0.002
	(0.003)	(0.004)	(0.004)	(0.005)	(0.008)
AMIHUD	0.073***	0.638	0.061***	0.525*	0.457
	(0.009)	(0.393)	(0.007)	(0.311)	(0.337)
SPREAD	0.029	0.444	0.033	0.399	0.757
	(0.151)	(0.619)	(0.157)	(0.768)	(0.826)
VOLATILITY	-0.286***	-0.101	-0.139	-0.068	0.052
	(0.105)	(0.189)	(0.090)	(0.165)	(0.210)
ΔTURNOVER	0.138	0.055	0.047	0.110	0.234
	(0.096)	(0.167)	(0.141)	(0.159)	(0.152)
Population	7.312	1.179			
	(6.202)	(1.151)			
GDP per Capita	-5.420**	-0.255			
	(2.638)	(0.516)			
Estimation procedure	OLS	FMB	OLS	FMB	FMB
Clustered standard errors?	by state	no	by industry	no	no
Fixed effects?	monthly, firm, and state	state	monthly, firm, and industry	industry	no
R-Squared	0.0576	0.1911	0.0558	0.3565	0.1234

Note: Panel (OLS) and Fama-MacBeth (1973) (FMB) regressions in which the dependent variable is the DGTW characteristic-adjusted abnormal returns in regressions (1) to (4) and raw returns in (5) evaluated at month t+1. This table checks the robustness of the main results of the paper to state and industry effects, raw returns and suggests return reversals. *Abnormal asymmetric attention* is the difference between *local abnormal attention* and *national abnormal attention*. All regressions control for the following firm characteristics: log(ME) is the natural logarithm of the market capitalization in month t; log(BE/ME) is the natural logarithm of the book-to-market value of equity; RET is the return of the stock during month t; RET[t-13,t-2] is the cumulative return of the stock between t-13 and t-2; AMIHUD is the liquidity measure from Amihud (2002) at month t; SPREAD is the proportional quoted bid-ask spread at month t; VOLATILITY is the standard deviation of the daily stock returns at month t; ΔTURNOVER is the log difference of stock turnover between t and t-1. We include monthly and firm fixed effects in all panel regressions. The first two regressions control for state fixed effects and the following state characteristics: GDP per capita and population. The third and fourth equations control for industry fixed effects. We define industry using 2-digit SIC codes. The fifth equation checks the robustness of regression (2) in Table 3 to the use of raw returns as a dependent variable. The symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 6: Excess Return on Portfolios Double Sorted by Abnormal Asymmetric Attention and Remote Location

		Raw Returns			Risk-Adjusted Returns		
		No-asym	High-asym	High-No	No-asym	High-asym	High-No
Metro Stocks	EW Excess Returns	-0.10	0.25	0.35	-0.09	0.14	0.23
		(0.17)	(0.39)	(0.37)	(0.16)	(0.31)	(0.33)
	VW Excess Returns	-0.29	-0.12	0.17	-0.30**	0.02	0.32
		(0.18)	(0.47)	(0.47)	(0.15)	(0.37)	(0.37)
Remote Stocks	EW Excess Returns	0.29**	1.60**	1.31*	0.14	1.39***	1.25***
		(0.13)	(0.75)	(0.76)	(0.13)	(0.30)	(0.29)
	VW Excess Returns	0.12	0.94**	0.82*	0.05	0.65*	0.60*
		(0.21)	(0.41)	(0.46)	(0.18)	(0.33)	(0.35)

Note: Jensen's alphas for portfolios double sorted according to *abnormal asymmetric attention* and remote location. *Abnormal asymmetric attention* is the difference between *local abnormal attention* and *national abnormal attention*. Remote location is the minimum distance between the city where the stock is headquartered and the 21 most populated cities in U.S. Each month, we sort stocks into quintiles based on remote location. In each of these remote location quintiles, we then form the following three portfolios based on *abnormal asymmetric attention*: i) high-asymmetry portfolio consists of stocks with Relative ASVI above the 80th percentile; ii) no-asymmetry portfolio consists of stocks that are not included in the high-asymmetry portfolio; iii) long-short portfolio is a zero-investment portfolio that longs high-asymmetry stocks and shorts no-asymmetry stocks. We form these three portfolios for every remote location quintile every month and calculate the following-month excess return over the risk free rate for each portfolio. Then we regress the time-series excess returns on the five-factor model that includes the three Fama and French factors, the momentum factor and the liquidity factor. Finally we report the alphas of the five-factor model with both equal-weighted and value-weighted next-month excess returns over the risk free rate for the three portfolios sorted by Relative ASVI for stocks in the first and fifth remote location quintiles. For robustness, we also report the alphas when we calculate the next-month DGTW abnormal returns for each portfolio. The symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 7: Excess Return on Portfolios Double Sorted by Abnormal Asymmetric Attention and Liquidity

		Raw Returns			Risk-Adjusted Returns		
		No-asym	High-asym	High-No	No-asym	High-asym	High-No
Liquid Stocks	EW Excess Returns	-0.08	0.49	0.57	-0.11	0.28	0.39
		(0.16)	(0.31)	(0.37)	(0.15)	(0.31)	(0.32)
	VW Excess Returns	-0.03	0.44	0.48	-0.09	0.33	0.42*
		(0.14)	(0.29)	(0.36)	(0.08)	(0.22)	(0.24)
Illiquid Stocks	EW Excess Returns	0.77***	1.47***	0.70*	0.47**	1.19***	0.72*
		(0.19)	(0.33)	(0.39)	(0.23)	(0.34)	(0.42)
	VW Excess Returns	0.12	1.31***	1.19***	0.07	0.87***	0.81**
		(0.21)	(0.34)	(0.39)	(0.19)	(0.30)	(0.34)

Note: Jensen's alphas for portfolios double sorted according to *abnormal asymmetric attention* and Amihud (2002) liquidity measure. *Abnormal asymmetric attention* is the difference between *local abnormal attention* and *national abnormal attention*. Each month, we sort stocks into quintiles based on the Amihud measure. In each of these liquidity quintiles, we then form the following three portfolios based on *abnormal asymmetric attention*: i) high-asymmetry portfolio consists of stocks with Relative ASVI above the 80th percentile; ii) no-asymmetry portfolio consists of stocks that are not included in the high-asymmetry portfolio; iii) long-short portfolio is a zero-investment portfolio that longs high-asymmetry stocks and shorts no-asymmetry stocks. We form these three portfolios for every liquidity quintile every month and calculate the following-month excess return over the risk free rate for each portfolio. Then we regress the time-series excess returns on the five-factor model that includes the three Fama and French factors, the momentum factor and the liquidity factor. Finally we report the alphas of the five-factor model with both equal-weighted and value-weighted next-month excess returns over the risk free rate for the three portfolios sorted by Relative ASVI for stocks in the first and fifth liquidity quintiles. For robustness, we also report the alphas when we calculate the next-month DGTW abnormal returns for each portfolio. The symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.