Asymmetric Attention and Stock Returns*

Peter Cziraki, University of Toronto
Jordi Mondria, University of Toronto
Thomas Wu, Verde Asset Management

March 2017

Abstract

This paper constructs a new measure of attention allocation by locals investors relative to nonlocals towards S&P 500 stocks using aggregate search volume in Google. We find that firms attracting abnormally high asymmetric attention from local relative to nonlocal investors earn higher returns. A portfolio that goes long in stocks with high asymmetric attention and short in stocks with no asymmetric attention has an alpha of 38 basis points per month. These results are consistent with the gradual diffusion of local information hypothesis. The new measure of asymmetric attention allows one to 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.

*We are grateful to Joey Engelberg, Pengjie Gao, Diego Garcia, Denis Gromb, Zoran Ivković, Chris Malloy, Lukasz Pomorski, Wei Xiong and seminar participants at the 2012 AFA meetings, 2011 SFS Cavalcade, 2011 SED meetings, 2011 EEA-ESEM meetings, HKU, HKUST, and College of William and Mary for helpful comments. We thank Haofei Zhang for research assistance. Jordi Mondria gratefully acknowledges the financial support from the Social Sciences and Humanities Research Council of Canada. Email: peter.cziraki@utoronto.ca; jordi.mondria@utoronto.ca; thomaswu@gmail.com.

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 construct a measure of the attention allocation decisions of local retail investors relative to nonlocals and study its asset pricing implications.

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, 2016). Recent work by Da, Engelberg, and Gao (2011), Mondria, Wu, and Zhang (2010), and Drake, Roulstone, and Thornock (2012) 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 (2011), 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 feature of Google Trends that allows us to distinguish the location, by U.S. state, in which searches are performed. We 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 retail 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 retail investors. We focus on stocks included in the S&P 500 between January 2004 and December 2013. A portfolio that goes long in stocks with high asymmetric attention and shorts stocks with no asymmetric attention has a Jensen's alpha of 38 basis points (bps) per month that is statistically and economically significant.

Google searches capture the information acquisition choices of only retail investors since institutional investors use Bloomberg terminals to search for information as postulated by Da, Engelberg and Gao (2011) and Ben-Rephael, Da and Israelsen (2016). In this paper, we assume that retail investors perform searches for only buying decisions. The literature has used two main arguments to rationalize this decision. First, most retail investors cannot short stocks and can only act on positive information to buy stocks. Second, as argued by Barber and Odean (2008), the decisions to buy or sell assets are fundamentally different. When choosing what stocks to buy, retail investors are mostly concerned about future returns, so information processing is an important component of their decision-making. In contrast, when choosing what stocks to sell, most retail investors only focus on past returns, so searches are almost irrelevant for their decision-making.

We consider two hypotheses about how attention allocation decisions affect asset prices: the gradual diffusion of local information hypothesis and the price-pressure hypothesis. The gradual diffusion of local information hypothesis is based on the theory by Hong and Stein (1999) in which local investors play the role of "newswatchers" and there are no "momentum traders". Local investors are plausibly among the first to receive information about local firms, which then spreads geographically across the country. This implies that an increase in attention about a stock by local relative to nonlocal investors leads to a permanent increase in asset prices. The price-pressure hypothesis is based on evidence presented by Barber and

Odean (2008) and Da, Engelberg, and Gao (2011) suggesting 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 a temporary increase in asset prices. Overall, our main empirical findings are consistent with the gradual diffusion of local information hypothesis . However, this should not rule out the price-pressure hypothesis as these theories have wide support at higher frequency such as weekly data as reported by Da, Engelberg, and Gao (2011).

To further examine the predictions of the gradual diffusion of local information hypothesis, 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 small stocks located in more remote places, where exogenous asymmetric information is more valuable, for stocks with higher bid-ask spreads and higher standard deviation of analyst forecasts. Specifically, we find an alpha of 67 bps per month for the long-short portfolio sorted by asymmetric attention for small stocks located in remote areas. This paper also contributes to the controversial literature on wether retail investors are informed traders, liquidity providers, or simply noise traders such as Kaniel, Saar and Titman (2008), Dorn, Huberman, and Sengmueller (2008), Hvidkjaer (2008), Barber, Odean, and Zhu (2009) and Kelley and Tetlock (2013). Our results provide suggestive evidence that local retail investors trade on information.

Our paper is also related 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. 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 advances the literature on geography one step further. Specifically, our measure of abnormal asymmetric attention captures asymmetric patterns of information processing between locals and nonlocals. In other words, this measure captures when local investors choose to process more information about local stocks than nonlocal investors. Hence, it allows us to predict whether and when stocks located in remote areas will actually suffer from asymmetric information and, thus, earn higher returns. Additionally, this paper also contributes to a growing literature exploring the effects of geography on asset prices (i.e., Pirinsky and Wang, 2006, and Garcia and Norli, 2012).

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 our empirical evidence is consistent with the gradual diffusion of local information hypothesis and the price-pressure hypothesis. 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

Trends.[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 the U.S. Census Bureau.

2.1 Aggregate search volume index

We obtain aggregate search volume data from Google search engine users using Google Trends as in Da, Engelberg, and Gao, (2011). In our specific case, we are interested in filtering search data at the national and state level. Google Trends uses IP address information to make an educated guess about the location where search queries originated. The data ranges from January 2004 to December 2013 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 2013.[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

[1] https://www.google.ca/trends

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

microstructure related biases), which leaves us with a total of 638 stocks. Following Da, Engelberg, and Gao (2011), 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 information about the company.[3] 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.[4] For each given ticker, we collect local and national SVI data simultaneously. This feature of Google Trends 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.

Searches for shorter tickers are more likely to be contaminated by typos, especially since the appearance of the auto-complete function on google. Using this intuition, in our main analysis we restrict our sample first to stocks with tickers longer than one character.[5] Also, as in Da, Engelberg, and Gao (2011), Google Trends does not return valid SVI data for tickers with low search volume. This issue is exacerbated in our paper when calculating local attention as Google Trends only returns data for terms that have a significant amount of search volume.

[3]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.

[4]Both variables are calculated as $ln(1 + SVI)$.

[5]Section 3.2 shows the robustness of our results to alternative classifications of contaminated tickers, as well as leaving all firms in the sample.

We solve this obstacle by using monthly data and restricting our sample to stocks with positive national SVI.

2.2 Local vs. national abnormal SVI

We start our analysis of whether unusual patterns in attention allocation have asset pricing implications by presenting descriptive statistics of the main variables. We measure unusual search volume using the abnormal SVI (ASVI) of a ticker. Following Da, Engelberg, and Gao (2011), ASVI is defined as the natural logarithm of the SVI during the current month less the natural logarithm of the mean SVI during the previous quarter (previous three months).[6] 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.[7]

The independent variables we use in the study are defined as follows: *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-12,t-1] is the cumulative return of the stock between months t-12 and t-1; *v*) AMIHUD is the illiquidity 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 $t-1$.

Panel A of Table 1 presents the summary statistics for our abnormal local attention,

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

abnormal national attention, and abnormal asymmetric attention variables, as well as the independent variables. The mean and median of the abnormal attention variables are around zero. These measures also have significant variation: the standard deviation of abnormal national attention, abnormal local attention, and abnormal asymmetric attention are 0.19, 0.67, and 0.67, respectively. The average (median) firm in our sample has a market capitalization of \$20.2 bn (\$ 8.8 bn). Because our sample period includes the strong market prior to the crisis, the crisis, as well as the subsequent recovery, average returns are relatively high, and there is considerable variation in returns. We verify that the maximum monthly and cumulative returns are due to the crash and recovery of Avis Budget Group in 2009-2010, and financial stocks during the crisis. Winsorizing our return data at the 1^{st} and 99^{th} percentiles to remove these outliers leaves the size and significance of our main results unaffected.

Panel B of Table 1 exhibits the relation of our abnormal asymmetric attention variable to several firm characteristics. Each month, we divide our sample into five quintiles according to theabnormal 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 that have an abnormal pattern of national and asymmetric attention earn higher future returns.

We use two 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 show that these regressions are robust if we remove from the sample stocks with tickers that have a generic meaning. Second, 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 2013. These results are reported in Table 2. The dependent variable is the DGTW characteristic-adjusted abnormal return from month $t+1$. The DGTW abnormal returns are constructed using the method developed by Daniel, Grinblatt, Titman, and Wermers (1997).[8] 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-12,t-1] is the cumulative return of the stock between $t-12$ and $t-1$; 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 column of Table 2, we replicate the results from Da, Engelberg, and Gao (2011) 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 DGTW abnormal stock returns. Da, Engelberg, and Gao (2011) argued that abnormal national attention has an effect in the first two weeks of the month, which is then reversed in

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

the future.

In the second column, we study the relation between stock returns and abnormal asymmetric attention. The coefficient of abnormal asymmetric attention 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 9.38 bps. Another way to quantify the economic significance of the coefficient of abnormal asymmetric attention is to obtain the difference between the first and fifth quintiles of abnormal asymmetric attention from Panel B in Table 1 and multiply it by the regression coefficient: $(0.53 + 0.58) \times 0.14$. All else equal, observations with high abnormal asymmetric attention earn future DGTW abnormal stock returns that are 15.54 bps higher than observations with low abnormal asymmetric attention. The significant effect of abnormal asymmetric attention is obtained after controlling for firm characteristics that previous studies found to affect stock returns.

Next, we examine whether the relation between abnormal asymmetric attention and future returns varies between small versus large firms – keeping in mind that these differences in size are interpreted within the S&P 500. The third and fourth columns report estimates of the same regressions as the first and second columns, restricting the sample to relatively smaller firms, defined as those with a below-median market capitalization. We find a statistically insignificant relation between abnormal national attention and stock returns, similarly to the result in the full sample. However, we also find that the relation between our measure of abnormal asymmetric attention and stock returns becomes more significant both statistically (higher t-statistic) and economically. For these smaller firms within the S&P 500, a one standard deviation increase in abnormal asymmetric attention is associated with an increase in next-month DGTW abnormal stock return of 16.8 bps. Comparing the lowest and the highest quintile of abnormal asymmetric attention, the difference in DGTW abnormal stock returns is 27.9 bps.[9] The last column of Table 2 shows that the predictive power of abnormal

[9] We verify that the average values of abnormal asymmetric attention across its quintiles are similar in the

asymmetric attention is limited, both statistically and economically, for the largest firms within the S&P 500.

3.2 Accuracy of abnormal asymmetric attention

In this section, we eliminate from the sample firms with tickers that may have a generic meaning (other than the ticker symbol of a given stock) or are otherwise prone to appear in searches for reasons other than investor attention to the stock. Table 3 uses several classification algorithms to identify such tickers.

The first column shows the baseline regression where the sample is only restricted by tickers longer than one character. The second column further restricts the sample to stocks with tickers longer than two characters. In the next three columns, we use the Merriam-Webster Dictionary as well as internet searches to determine whether a word may have a generic meaning either in itself, or as a commonly used abbreviation or jargon. We perform this classification ourselves (Dictonary 1, shown in the third column), and have the same task done independently by a doctoral student research assistant (Dictionary 2, shown in the fourth column). As a final test, to further enhance the reliability of our classification, we exclude from the sample all firms whose tickers are classified as having a generic meaning using either of the two approaches (Dictionary 1 and 2, shown in the fifth column).

Moving from column (1) to column (5) in Table 3, the statistical significance of our coefficient estimate of abnormal asymmetric attention remains the same, significant at the 1% level, while its size increases slightly. This pattern is consistent with the idea that google searches for firms with ticker symbols that have a generic meaning are a noisier measure of investor attention than google searches for firms with ticker symbols that do not have a generic meaning. Once this additional noise is cleaned from the data, the pattern we show in the baseline analysis persists, and becomes stronger.

overall distribution and for small (large) firms.

Finally, we also show the results from a regression where we use all of the sample, without any regard for whether tickers have a generic meaning or not. Estimates from this model, shown in the sixth column, are very similar in size and significance to those shown in our main specification.

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*) the *high-asymmetry* portfolio consists of stocks that in a given month have relative ASVI above the 80th percentile; *ii*) the *low-asymmetry* portfolio consists of stocks that in a given month have relative ASVI below the 20th percentile *high-asymmetry* portfolio; *iii*) the *long-short* portfolio is a zero-investment portfolio that in a given month goes long *high-asymmetry* stocks and shorts *low-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 low-asymmetry portfolios is significant if the estimated alpha of the long-short portfolio is statistically and economically significant.

The first three columns of Panel A in Table 4 report the raw excess returns for each of the three portfolios sorted by abnormal asymmetric attention. The low-asymmetry portfolio earns excess returns of 0.97% per month and the high-asymmetry portfolio earns excess returns of 1.26% per month. The long-short portfolio earns statistically significant excess returns of 29 bps. We find similar results when using value-weighted portfolios. The excess returns on the long-short portfolio increase to 40 bps, statistically significant at the 5% level.

In the last three columns of Panel A in Table 4, we look at the alphas estimated using the five-factor model. When we look at equally-weighted portfolios, the high-asymmetry portfolio experiences an average of 0.50% following-month excess return, while the low-asymmetry portfolio has an average of 0.17% following-month excess return. The long-short portfolio shows a 33 bps difference between the high- and low-asymmetry portfolios that is statistically and economically significant.

Looking at value-weighted returns, we find that the individual alphas are higher, at 0.81% for the high-asymmetry portfolio and 0.43% for the low-asymmetry portfolio. The return on the long-short portfolio is 38 bps, which is statistically and economically significant, is similar to the alpha observed for the equal-weighted case. The difference in magnitude for equal-weighted and value-weighted returns between the high-asymmetry and low-asymmetry portfolios is about twice as large than the value obtained in the cross-sectional regressions – although we note that the two magnitudes are not directly comparable.

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 that attract an abnormal amount of attention from local relative to nonlocal investors earn higher future returns. This result holds for excess returns and after adjusting for risk factors.

In Panel B of Table 4, we examine whether the long-short portfolio strategy based on abnormal asymmetric attention entails high exposures to any of the five factors in our model. We show the factor loadings of both the equal-weighted and the value-weighted long-short portfolios. All factor loadings are quite small, and statistically insignificant, with one exception. The equal-weighted long-short portfolio has a momentum beta of –0.13. We conclude that the long-short portfolio strategy based on abnormal asymmetric attention generates statistically and economically significant alphas without taking on significant factor exposures.

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 that 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 add state fixed effects to our Fama-MacBeth regressions. In the second column, we add state fixed effects and change the dependent variable to state-portfolio adjusted returns. Seasholes and Zhu (2010) highlight that many studies on local bias may suffer from a cross-sectional sampling error as neither firms, nor industries, nor investors are uniformly distributed across the U.S. To mitigate this issue, we construct state portfolios in the spirit of the local portfolios used in Seasholes and Zhu (2010), but using states instead of ZIP codes as the level of aggregation. In particular, for each U.S. state in each month, we calculate the return of a value-weighted portfolio of the stocks of S&P 500 firms headquartered in the state, and call this the return on the state portfolio in a given month. We then calculate the state-portfolio adjusted return as the return on a given stock minus the return on the corresponding state portfolio.[10]

In the third column, we introduce state characteristics such as GDP per capita, to control for more developed states, and population, to control for the size of the state. In a further attempt to rule out that our results are due to incorrect benchmarking and variation in returns across states, we also control directly for the return on the state portfolio. We find that the coefficient of GDP per capita is negative and statistically significant, population size and

[10]We use S&P 500 firms to form the portfolios for two reasons. First, we would like to avoid benchmarking S&P 500 firms against smaller firms as their characteristics and sensitivities to factors may be quite different. Second, this approach is conservative as it may attenuate the adjusted returns towards zero in states with few S&P 500 firms. Suppose that there is a state in which only one S&P 500 is headquartered. By construction, this firm will be the state portfolio for itself, leading to adjusted returns of zero. This attenuation issue is more severe in states with few S&P 500 firms.

the return on the state portfolio are 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 sum, the results are robust to the inclusion of state fixed effects, the inclusion of state characteristics, and to changing the return benchmark to a local portfolio.

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 fourth regression of Table 5, we run a Fama and MacBeth (1973) regression with industry fixed effects. 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. The significance of the coefficient of abnormal asymmetric attention remains unaltered with respect to results reported in Table 2, although its magnitude decreases from 0.14 to 0.10.

4.3 Alternative measure of returns

In the fifth regression of Table 5, we show that our main result in Table 2 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 the coefficient of abnormal asymmetric attention is also statistically and economically significant.

5 Discussion: attention allocation theories

This section discusses the interpretation of our results. In particular, we consider whether our empirical evidence is consistent with the gradual diffusion of local information hypothesis or the price-pressure hypothesis.

5.1 Gradual diffusion of local information

The hypothesis of gradual diffusion of local information is based on the theory presented by Hong and Stein (1999), where local investors play the role of newswatchers and there are no momentum traders. Intuitively, if we assume that investors have a local information advantage, then the local information will diffuse gradually towards nonlocal investors and prices will adjust slowly to new information, causing underreaction.

Under this theory, the arrival of private news about local companies leads investors to start processing more public information about these local firms before making any buying decision. All 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 to an increase in their holdings and in the price of the stock. An assumption implicit in this hypothesis is that retail investors perform searches for only buying decisions. As argued before, previous literature has motivated this assumption based on two arguments. First, most retail investors only act on positive news as they cannot short stocks. Second, as argued by Barber and Odean (2008), when deciding to buy a stock, retail investors focus on future returns, so information processing is an important component of their decision-making. In contrast, when deciding to sell a stock, retail investors only focus on past returns, so information processing is an irrelevant component of their decision-making.

The empirical implication of the gradual diffusion of local information hypothesis is that one can infer the arrival of unobservable private information to locals by observing investors' attention allocation behavior. According to these theories, if local investors process more public information about local stocks than do nonlocal investors, this implies 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.[11] This implies that an increase in the abnormal asymmetric attention received by a stock will tend to be associated with an increase in the buying pressure from local investors and, as a result, higher returns should be observed. The empirical implication of these theories is that firms attracting abnormally high asymmetric attention earn higher future returns. Our findings in Tables 2 and 4 are thus consistent with informational-based attention allocation theories.

5.2 Price pressure

The price-pressure hypothesis studied in papers such as and Odean (2008) and Da, Engelberg, and Gao (2011) is based on the idea 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 a particular stock, there will be an increase in buying pressure that leads to an increase in the holdings and price of the stock.

The empirical implication of these theories is that if we observe investors processing more public information about a certain stock, this means that this particular stock grabbed the attention of investors and its price should increase. Thus, the prediction of the price-pressure hypothesis is that an increase in investor attention is associated with higher future returns. This prediction relates to changes in investor attention, and not to changes in the difference between national and local attention (i.e. asymmetric attention). The common prediction of these models is that it isabnormal national attention or abnormal local attention that is

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

associated with higher future returns instead of abnormal asymmetric attention. We test the price-pressure hypothesis in two settings: using changes in national attention, and using changes in local attention.

First, 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. According to the price-pressure hypothesis, an increase in the abnormal national attention received by a stock should be associated with an increase in the buying pressure from investors and, as a result, should predict higher returns.

The results in columns 1, 3, and 5 of Table 2 are not consistent with this explanation: we show that abnormal national attention does not predict one-month ahead stock returns. Indeed, our results confirm the findings of Da, Engelberg, and Gao (2011) at the monthly frequency. They show that there is an increase in asset prices over the two weeks following the attention-grabbing event, which is then reversed in the future.

Second, it is also possible that it is the attention allocated only by locals which is driving the results as opposed to abnormal asymmetric attention. This finding would also be consistent with the price-pressure hypothesis. We could interpret an increase in abnormal local attention to indicate a 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.

To test this alternative hypothesis, we examine the relationship between abnormal local attention and future returns of equal- and value-weighted portfolios.

Panel C of 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 *low-local* portfolio includes those below the 20th percentile. The *long-short-local* portfolio is constructed by taking 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. We show excess returns, as well as alphas from a five-factor model.

Using equal-weighted portfolios, the high-local portfolio experiences an average 1.14% following-month excess return, while the low-local portfolio had an average 1.08% following-month excess return. However, the long-short portfolio has an alpha that is small, and not statistically different from zero. We find similar results using value-weighted portfolios. The right three columns of Panel C show alphas from a five-factor model. When looking at equal-weighted portfolios, the alpha of the high-loca portfolio is 38 bps, while the alpha of the low-local portfolio is 36 bps. Similarly to excess returns, we find that the long-short portfolio has an alpha that is close to zero and statistically insignificant. We find similar results for value-weighted portfolio alphas.

Our results suggest that neither abnormal national attention nor abnormal local attention predicts future returns. Rather, it is the *difference* between abnormal local attention and abnormal national attention that predicts stock returns one month ahead. Thus, our results are not consistent with the price-pressure hypothesis. One potential explanation for this finding is related to the data frequency. The empirical evidence supporting the price-pressure hypothesis is mostly based on daily and weekly data.

6 Information frictions: evidence from three-way portfolio sorts

The hypothesis of gradual diffusion of local information relies on investors having an initial 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 may lead to the existence of asymmetric information; iii) local media is, on average, positively biased towards local stocks.

Next, we examine whether the abnormal return associated with abnormal asymmetric attention is arising from information frictions. According to the gradual diffusion of local information hypothesis, 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 triple sorting stocks first by their size, second by their geographical location relative to a metropolitan area, and third by abnormal asymmetric attention. Following, Coval and Moskowitz (2001) and Malloy (2005), we define *remote* location based on 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 predicts that the return differential between the high- and no-asymmetry portfolios is more pronounced for small stocks located in more remote places.

Each month, we sort stocks into large and small based on their market capitalization. Then, within the large and the small size groups, we sort stocks into terciles based on remote location. Finally, for each distance-size partition, we repeat the analysis shown in Table 4 and form three portfolios sorted by relative ASVI: a high-asymmetry portfolio (relative ASVI above the 80^{th} percentile), a low-asymmetry portfolio (relative ASVI below the 20^{th} percentile) and a long-short portfolio. We calculate following-period returns every month for each portfolio defined by its size group, remote location tercile and relative ASVI quintile. In Table 6, we report both equal- and value-weighted following-month alphas for the three portfolios sorted by abnormal asymmetric attention for large and for small stocks in the first and third remote location terciles. Table 6 provides evidence in support of our information frictions conjecture. The abnormal asymmetric attention effect is more evident for small stocks located in more remote locations where local private 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 it is difficult for private information to survive. Similarly, the abnormal asymmetric attention effect is weak and statistically insignificant for large firms irrespective of their geographical location relative to a metropolitan area. We also test whether the long-short portfolio alphas are different for remote versus metro stocks, and find no significant difference.

For small stocks located in remote locations, we find economically and statistically significant alphas in the long-short portfolio using both equal- or value-weighted returns. For instance, with the value-weighted approach, we find an alpha of 67 bps for the long-short portfolio. The alphas are substantially larger than in the baseline analysis for both the equally-weighted (55 bps vs. 33 bps) and the value-weighted portfolio (67 bps vs. 38 bps). We also find that the long-short portfolio alphas for remote stocks are significantly different from the alphas estimated for metro stocks.

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 bid-ask spreads as a liquidity measure. We test our hypotheses by triple sorting stocks first into two groups based on size, then into terciles based on their bid-ask spreads, as a measure of liquidity, and then by abnormal asymmetric attention. Our information frictions hypothesis predicts that the return differential between the high- and low-asymmetry portfolios is more pronounced for illiquid stocks. Each month, we sort stocks into two size groups based on their market capitalization (above vs. below median), then within these size groups, into terciles based on their bid-ask spread.

For each of these liquidity terciles, we form three portfolios sorted by relative ASVI. Specifically, we form a high-asymmetry portfolio, a low-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 size-liquidity cell and every month. Table 7 reports both equal- and value-weighted following-month alphas for all three portfolios sorted by abnormal asymmetric attention for small and for large stocks in the bottom and top liquidity terciles.

Table 7 reveals large and statistically significant alphas for the long-short portfolio constructed based on abnormal asymmetric attention for small, illiquid firms. The equal-weighted portfolio earns an alpha of 91 bps per month, and the value-weighted portfolio earns an alpha of 69 bps per month. Both of these portfolio alphas are statistically significant. To a lesser extent, this differential effect of liquidity is also present in large, but relatively illiquid S&P 500 stocks. For these firms the equal-weighted long-short portfolio based on abnormal asymmetric attention generates an alpha of 41 bps, which is not statistically significant. However, the value-weighted long-short portfolio attains a statistically significant alpha of 70 bps.

In contrast, for large, liquid (low bid-ask spread) stocks, the alpha of the long-short portfolio is only 9 bps, and it is not significantly different from zero. The alpha of the value-weighted long-short portfolio of large, liquid S&P 500 stocks is estimated to be 0 bps. Similarly, we find statistically insignificant portfolio alphas for small, liquid stocks, both using the equally-weighted (22 bps) and the value-weighted approach (32 bps).

Finally, we also find that the long-short alpha of the portfolio strategy based on abnormal asymmetric attention is significantly different in liquid vs. illiquid firms. In the small size group, the equally-weighted portfolio strategy earns a significantly higher return for illiquid firms. In the large size group, it is the value-weighted long-short portfolio that performs significantly better for illiquid firms.

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 large and highly liquid compared to all stocks listed on the NYSE and the NASDAQ. Overall, Tables 6 and 7 provide evidence in support of the information frictions hypothesis as an explanation to the abnormal asymmetric attention effect documented in this paper.

Security analysts play an important role in generating and interpreting new information about securities. To further examine whether the effect of abnormal asymmetric attention is higher for stocks with high information frictions, we perform the triple portfolio sorts similarly to the previous sections, but using analyst forecast dispersion as a measure of the degree of information frictions regarding a particular stock. Following the method of Diether, Malloy, and Scherbina (2002), we calculate analyst forecast disperson as the standard deviation of earnings forecasts scaled by the absolute value of the mean earnings forecast using data from I/B/E/S.[12] Thus, we sort stocks first into two groups based on size, then into terciles of analyst forecast dispersion, and finally by abnormal asymmetric attention. For each analyst forecast dispersion tercile, we form a high-asymmetry portfolio, a low-asymmetry portfolio, and along-short portfolio as before. We then calculate the following-period return of each portfolio for every size-dispersion cell and every month.

Table 8 reports both equal- and value-weighted following-month alphas for all three portfolios sorted by abnormal asymmetric attention for small and for large stocks in the bottom and top analyst forecast dispersion terciles. The main insight from Table 8 is that long-short portfolio based on abnormal asymmetric attention generates large and statistically significant alphas only for small firms that have a high analyst forecast dispersion. The equally-weighted portfolio alpha equals 99 bps. However, the value-weighted portfolio alpha is even larger, at

[12] We are grateful to an anonymous referee for suggesting this triple sorting specification.

1.34% per month, and significant at the 1% level. These alphas are 3-3.5 times larger than those obtained using the simple portfolio strategy reported in Table 4. Within the group of small firms, we also find that the *long-short* portfolio alphas are significantly higher for firms with high forecast dispersion compared to firms with low forecast dispersion. This significant difference is confined to the small size group. In contrast, the difference is insignificant, and has the opposite sign for large firms.

Overall, this difference in portfolio returns is consistent with the effects of abnormal asymmetric attention on future returns being more pronounced for stocks with more information asymmetries. In contrast, portfolio alphas from the long-short strategy based on abnormal asymmetric attention are smaller and not statistically significant for large firms, and small firms with low analyst forecast dispersion.

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.

6.1 Price reversal

We now perform two tests to examine whether the predictability using abnormal asymmetric attention reverses at longer horizons.

First, we repeat the Fama-MacBeth regressions shown in Table 2, but regress cumulative DGTW benchmark-adjusted returns in months (t+1) through (t+2), (t+1) through (t+3),

. . . , (t+1) through (t+12) on our investor attention measure in month t. These tests are shown in Table 9. For comparison, we include the result of our main regression in column 1. For later months, we find that the relation between our measure of investor attention in month t and cumulative returns over months (t+1) through (t+k) becomes stronger for k=2 and k=3 both in terms of statistical significance and economic significance. After the 3-month period of (t+1) through (t+3), the relation and its statistical significance appears to weaken. We estimate the largest coefficient, 0.26 (compared to 0.14 in the main analysis) for cumulative returns in the period of months (t+1) to (t+7), although the statistical significance of this effect is smaller.

Second, we repeat the regressions shown in Table 2, but regress returns in month (t+2), (t+3), . . . , (t+12) on our investor measure in month t. We summarize these tests in Table 10. We find that regression coefficients are insignificant in all later months. For later months, we find that the regression coefficients are initially positive in months (t+2) and (t+3), but insignificant, with t-statistics ranging between 1 and 1.24. Then, the coefficients of the attention measure become smaller in absolute magnitude, and statistically insignificant. We find a negative relation for month (t+12), although the coefficient is not statistically significant.

The results from both of these tests suggest that abnormal asymmetric attention predicts one-month-ahead returns. We do not observe a significant reversal over the next months. If anything, from the analysis of the cumulative returns, it appears that there is a slight continuation in the positive correlation between future returns and abnormal asymmetric attention. However, the month-by-month analysis highlights that this is because abnormal asymmetric attention predicts one-month-ahead returns, not because it is a statistically significant predictor of returns in individual months past the first. This finding is consistent with the the gradual diffusion of local information hypothesis. The information that local investors receive gradually diffuses to nonlocal investors and has permanent effects on asset prices, suggesting the information received by locals is information about fundamentals.

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 nonlocals. Specifically, portfolios consisting of stocks with high abnormal asymmetric attention obtain following-month returns that are 38 bps higher than portfolios consisting of 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 the gradual diffusion of local information hypothesis.

Several additional tests suggest that our results become stronger for stocks of firms with a greater degree of information frictions: stocks of firms located in remote areas, stocks with high bid-ask spreads, and stocks with a high degree of analyst forecast dispersion. 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. The novel measure of asymmetric attention allows 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 of or against asymmetric information as the explanation to many puzzles.

References

[1] Amihud, Y., 2002. Illiquidity and stock returns: Cross-section and time-series effects. Journal of Financial Markets 5, 31-56.

[2] Bae, K., Stulz, R., Tan, H., 2008. Do local analysts know more? A cross-country study of the performance of local analysts and foreign analysts. Journal of Financial Economics 88, 581-606.

[3] Barber, B., Odean, T., 2008. All That Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors. Review of Financial Studies 21, 785-818.

[4] Barber, B. M., Terrance O., and Zhu, N., 2009. Do retail trades move markets? Review of Financial Studies 21, 151-186.

[5] Ben-Rephael, A., Da, Z., Israelsen, R. D., 2016. It Depends on Where You Search: Institutional Investor Attention and Under-Reaction to News. Accepted at the Review of Financial Studies.

[6] Carhart, M., 1997. On Persistence in Mutual Fund Performance. Journal of Finance 52, 57-82.

[7] Coval, J., Moskowitz, T., 1999. Home bias at home: local equity preference in domestic portfolios. Journal of Finance 54, 2045-2073.

[8] Coval, J, Moskowitz, T., 2001. The Geography of Investment: Informed Trading and Asset Prices. Journal of Political Economy 109, 811-841.

[9] Cremers, M., Petajisto, A., Zitzewitz, E., 2010. Should Benchmarks Indices Have Alpha? Revisiting Performance Evaluation. Working Paper.

[10] Da, Z., Engelberg, J., Gao, P., 2011. In Search of Attention. Journal of Finance 66, 1461-1499.

[11] Daniel, K., Grinblatt, M., Titman, S., Wermers, R., 1997. Measuring Mutual Fund Performance with Characteristic-Based Benchmarks. Journal of Finance 52, 1035-1058.

[12] Davis, J., Fama, E., French, K., 2000. Characteristics, Covariances, and Average Returns: 1929-1997. Journal of Finance 55, 389-406.

[13] Diether, K.B., Malloy, C.J., Scherbina, A., 2002. Differences of Opinion and the Cross Section of Stock Returns. Journal of Finance 57, 2113-2141.

[14] Dorn, D., Huberman, G., Sengmueller, P., 2008. Correlated Trading and Returns. The Journal of Finance 63: 885-920.

[15] Drake, M.S., Roulstone, D. T., Thornock, J. R., 2012. Investor Information Demand: Evidence from Google Searches Around Earnings Announcements. Journal of Accounting Research 50, 1001-1040.

[16] Fama, E., French, K., 1993. Common Risk Factors in the Returns on Stocks and Bonds. Journal of Financial Economics 33, 3-56.

[17] Fama, E., MacBeth, J., 1973. Risk, return and equilibrium: empirical tests. Journal of Political Economy 81, 607-636.

[18] Fang, L., Peress, J., 2009. Media coverage and the cross-setion of stock returns. Journal of Finance 64, 2023-2052.

[19] Frieder, L., Subrahmanyam, A., 2005. Brand Perceptions and the Market for Common Stock. Journal of Financial and Quantitative Analysis 40, 57-85.

[20] Garcia, D., Norli, O., 2012. Geographic Dispersion and Stock Returns. Journal of Financial Economics 106, 547-565.

[21] Grote, M. and M. Umber, 2006. Home biased? A Spatial Analysis of the Domestic Merging Behavior of US Firms. Working Paper.

[22] Hong, H., Stein, J. C., 1999. A Unified Theory of Underreaction, Momentum Trading and Overreaction in Asset Markets. Journal of Finance 6, 2143-2184.

[23] Hou, K., Peng, L., Xiong, W., 2008. A tale of two anomalies: The implications of investor attention for price and earnings momentum. Working Paper.

[24] Hou, K., Robinson, D., 2006. Industry Concentration and Average Stock Returns. Journal of Finance 61, 1927-1956.

[25] Hvidkjaer, S., 2008. Small Trades and the Cross-Section of Stock Returns. Rev Financial Studies 21, 1123-1151.

[26] Ivkovic, Z., Weisbenner, S., 2005. Local Does As Local Is: Information Content of the Geography of Individual Investors' Common Stock Investments. Journal of Finance 60, 267-306.

[27] Kacperczyk, M., Van Nieuwerburgh, S., Veldkamp, L., 2016. A Rational Theory of Mutual Funds' Attention Allocation. Econometrica 84, 571-626.

[28] Kaniel, R., Saar, G., Titman, S., 2008. Individual Investor Trading and Stock Returns. The Journal of Finance 63, 273-310.

[29] Kelley, E. K., Tetlock, P. C., 2013. How Wise Are Crowds? Insights from Retail Orders and Stock Returns. The Journal of Finance 68, 1229-1265.

[30] Lou, D., 2008. Attracting Investor Attention through Advertising. Working Paper.

[31] Loughran, T., Schultz, P., 2005. Liquidity: Urban versus rural firms. Journal of Financial Economics 78, 341-374.

[32] Malloy, C., 2005. The Geography of Equity Analysis. Journal of Finance 60, 719-755.

[33] Mondria, J., Wu, T., Zhang, Y., 2010. The Determinants of International Investment and Attention Allocation: Using internet search query data. Journal of International Economics 82, 85-95.

[34] Pastor, L., Stambaugh, R., 2003. Liquidity risk and expected stock returns. Journal of Political Economy 111, 642-685.

[35] Pirinsky, C., Wang, Q.,2006. Does Corporate Headquarters Location Matter for Stock Returns?. Journal of Finance 61, 1991-2015.

[36] Portes, R., Rey, H., 2005. The Determinants of Cross Border Equity Flows. Journal of International Economics 65, 269-296.

[37] Seasholes, M. S., Zhu, N., 2010. Individual Investors and Local Bias. The Journal of Finance 65, 1987-2010.

[38] Uysal, V., Kedia, S., Panchapagesan, V., 2008. Geography and acquirer returns. Journal of Financial Intermediation 17, 256-275.

Table 1: Summary Statistics and Quintiles by Asymmetric Attention

Panel A: Descriptive Statistics

	Mean	Std. Dev.	Min	Median	Max	No. Stocks
Abnormal national attention	-0.007	0.19	-2.28	0	2.29	638
Abnormal local attention	-0.017	0.67	-4.58	0	4.62	638
Abnormal asymmetric attention	-0.011	0.67	-4.72	0	4.96	638
ME	20,200	38,000	94	8,820	627,000	638
BE/ME	0.45	0.43	-26.93	0.38	15.96	638
RET	1.18	10.56	-86.86	1.23	269	638
RET[t-12,t-1]	17.03	47.97	-99.03	13.31	2,530	638
AMIHUD	0.126	2.325	0.000	0.006	112.71	638
SPREAD	0.093	0.512	-2.809	0.046	110.44	638
VOLATILITY	2.041	1.62	0.00	2	45.25	638
ΔTURNOVER	0.002	0.337	-3.091	-0.010	3.420	638

Panel B: Averages by Abnormal Asymmetric Attention (Relative ASVI) Quintiles

	Q1	Q2	Q3	Q4	Q5
Abnormal asymmetric attention	-0.58	-0.08	0.00	0.08	0.53
ME	18,500	22,600	23,200	22,900	17,600
BE/ME	0.45	0.45	0.46	0.46	0.46
RET	1.12	1.14	1.18	1.23	1.17
RET[t-12,t-1]	16.71	15.82	15.44	15.22	15.65
AMIHUD	0.144	0.088	0.041	0.119	0.146
SPREAD	0.091	0.100	0.092	0.094	0.096
VOLATILITY	2.10	2.03	2.02	2.03	2.11
ΔTURNOVER	0.006	0.002	0.002	-0.001	-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. 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 the 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 A provides summary statistics of the variables used in the analysis of the paper. 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), measured in millions of dollars; 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-12,t-1] is the cumulative return of the stock between t-12 and t-1; v) AMIHUD is the illiquidity 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 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 into 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 2: Abnormal Asymmetric Attention and Stock Returns

Firms	All	All	Small	Small	Large	Large
Month	t+1	t+1	t+1	t+1	t+1	t+1
Regression	(1)	(2)	(3)	(4)	(5)	(6)
Abnormal national attention	-0.239		-0.210		-0.259	
	(-1.372)		(-0.747)		(-1.228)	
Abnormal asymmetric attention		0.140***		0.251***		0.052
		(2.641)		(3.176)		(0.834)
log(ME)	-0.306***	-0.305***	-0.813***	-0.829***	-0.085**	-0.085**
	(-8.723)	(-8.819)	(-8.094)	(-8.286)	(-1.983)	(-2.076)
log(BE/ME)	-0.033	-0.029	-0.114	-0.104	-0.004	-0.002
	(-0.475)	(-0.416)	(-1.386)	(-1.240)	(-0.056)	(-0.022)
RET	0.003	0.002	0.004	0.003	0.001	-0.000
	(0.563)	(0.419)	(0.721)	(0.570)	(0.111)	(-0.007)
RET[t-12,t-1]	-0.002	-0.002	0.001	0.001	-0.003	-0.003
	(-0.457)	(-0.476)	(0.255)	(0.281)	(-0.720)	(-0.767)
AMIHUD	0.324	0.356	1.135	1.120*	7.811	7.318
	(0.854)	(0.963)	(1.625)	(1.698)	(1.115)	(1.077)
SPREAD	0.733	0.721	0.287	0.133	-0.042	0.007
	(0.917)	(0.900)	(0.306)	(0.142)	(-0.036)	(0.006)
VOLATILITY	0.062	0.063	0.114	0.121	-0.093	-0.098
	(0.530)	(0.538)	(0.943)	(0.996)	(-0.628)	(-0.667)
ΔTURNOVER	-0.077	-0.087	-0.056	-0.069	-0.034	-0.041
	(-0.403)	(-0.446)	(-0.246)	(-0.305)	(-0.143)	(-0.173)
R-squared	0.052	0.052	0.069	0.069	0.079	0.078

Note: Monthly Fama-MacBeth (1973) regressions from January 2004 to December 2013. The dependent variable is the DGTW characteristic-adjusted abnormal return in month t+1. Columns 1 and 2 show results for all stocks in our sample. Columns 3 and 4 show results for small stocks, defined as those with market capitalization below the median. Columns 5 and 6 show results for large stocks, defined as those with market capitalization above the median. *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, and are winsorized at the 1st and the 99th percentile. 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-12,t-1] is the cumulative return of the stock between t-12 and t-1; AMIHUD is the illiquidity 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 symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 3: Excluding tickers with a generic meaning

Classification rule	Length above 1	Length above 2	Dictionary 1	Dictionary 2	Dictionary 1 and 2	No selection
Regression	(1)	(2)	(3)	(4)	(5)	(6)
Abnormal national attention	0.140***	0.154***	0.167***	0.175***	0.175***	0.140***
	(2.641)	(2.817)	(2.782)	(2.960)	(2.909)	(2.630)
log(ME)	-0.305***	-0.312***	-0.291***	-0.282***	-0.291***	-0.306***
	(-8.819)	(-8.740)	(-7.678)	(-7.884)	(-7.815)	(-9.023)
log(BE/ME)	-0.029	-0.005	-0.022	-0.025	-0.021	-0.026
	(-0.416)	(-0.073)	(-0.269)	(-0.331)	(-0.266)	(-0.373)
RET	0.002	0.002	0.002	0.001	0.002	0.002
	(0.419)	(0.298)	(0.369)	(0.124)	(0.250)	(0.488)
RET[t-12,t-1]	-0.002	-0.002	-0.003	-0.002	-0.003	-0.002
	(-0.476)	(-0.493)	(-0.716)	(-0.582)	(-0.652)	(-0.463)
AMIHUD	0.356	0.279	0.936	0.974	0.885	0.343
	(0.963)	(0.738)	(1.196)	(1.230)	(1.086)	(0.916)
SPREAD	0.721	0.634	0.544	0.803	0.548	0.792
	(0.900)	(0.827)	(0.618)	(0.998)	(0.634)	(0.993)
VOLATILITY	0.063	0.049	0.062	0.039	0.054	0.057
	(0.538)	(0.401)	(0.498)	(0.319)	(0.431)	(0.485)
ΔTURNOVER	-0.087	-0.079	-0.038	-0.025	-0.047	-0.075
	(-0.446)	(-0.399)	(-0.178)	(-0.120)	(-0.221)	(-0.391)
R-squared	0.052	0.056	0.062	0.060	0.062	0.052

Note: This table presents results our main model from column 2 of Table 3 re-estimated for different subsamples. Monthly Fama-MacBeth (1973) regressions from January 2004 to December 2013. The dependent variable is the DGTW characteristic-adjusted abnormal return in month t+1. Column 1 shows the main model, which excludes firms with a ticker symbol consisting of one character. Column 2 shows model estimates excluding firms with a ticker symbol consisting of one or two characters. In column 3, we exclude firms whose tickers we classify as having a generic meaning based on the Merriam-Webster Dictionary and internet searches. In column 4, we exclude firms whose tickers were classified by our research assistant as having a generic meaning using the same search algorithm. In column 5, we exclude all firms that either we or the research assistant classified as having a generic meaning. In column 6, we show estimates using all of the S&P 500 firms, irrespective of the length of their ticker symbol, and whether their ticker symbol has a generic meaning or not. *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, and are winsorized at the 1st and the 99th percentile. 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-12,t-1] is the cumulative return of the stock between t-12 and t-1; AMIHUD is the illiquidity 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 symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 4: Portfolios Sorted by Abnormal Asymmetric Attention

Panel A: Portfolios Sorted by Abnormal Asymmetric Attention						
	Excess returns			Five-factor alphas		
	Low-asym	High-asym	High-Low	Low-asym	High-asym	High-Low
EW excess	0.97*	1.26**	0.29*	0.17	0.50***	0.33**
returns	(0.51)	(0.53)	(0.16)	(0.11)	(0.14)	(0.17)
VW excess	0.99***	1.39***	0.40**	0.43***	0.81***	0.38***
returns	(0.37)	(0.39)	(0.16)	(0.11)	(0.13)	(0.14)

Panel B: Factor loadings of long-short portfolios sorted by abnormal asymmetric attention						
	Alpha	Mkt-Rf	SMB	HML	MOM	LIQ
EV excess returns	0.33**	-0.04	0.01	-0.06	-0.13**	-0.004
	(0.17)	(0.06)	(0.13)	(0.08)	(0.06)	(0.04)
VW excess returns	0.38***	0.02	-0.07	0.06	-0.06	0.04
	(0.14)	(0.04)	(0.09)	(0.09)	(0.04)	(0.05)

Panel C: Portfolios Sorted by Abnormal Local Attention						
	Excess returns			Five-factor alphas		
	Low-asym	High-asym	High-Low	Low-asym	High-asym	High-Low
EW excess	1.08**	1.14**	0.06	0.36***	0.38***	0.02
returns	(0.49)	(0.52)	(0.14)	(0.08)	(0.13)	(0.12)
VW excess	1.10***	1.08**	-0.02	0.56***	0.51***	-0.05
returns	(0.36)	(0.42)	(0.17)	(0.08)	(0.13)	(0.16)

Note: Excess returns and 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 shows excess returns and alphas for the three portfolios sorted by *abnormal asymmetric attention*. Each month, we form three different portfolios: i) the high-asymmetry portfolio consists of stocks with Relative ASVI above the 80th percentile; ii) the low-asymmetry portfolio consists of stocks with Relative ASVI below the 20th percentile; iii) the long-short portfolio is a zero-investment portfolio that longs high-asymmetry stocks and shorts low-asymmetry stocks. We show the following-month excess return over the risk free rate for each portfolio and alphas from a five-factor model that includes the three Fama and French (1993) factors, the Carhart (1997) momentum factor and the Pastor and Stambaugh (2003) liquidity factor. Panel B exhibits factor loadings for the long-short portfolios of Panel A. Panel C presents excess returns and alphas for three portfolios sorted by *abnormal local attention*. The numbers in parentheses are Newey-West standard errors robust to heteroscedasticity and autocorrelation of up to 4 lags. 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

Dependent variable	DGTW adj. ret.	State adj. ret.	DGTW adj. ret.	DGTW adj. ret.	Raw return
Regression	(1)	(2)	(3)	(4)	(5)
Abnormal asymmetric attention	0.145***	0.123**	0.128**	0.106**	0.121**
	(2.723)	(2.073)	(2.446)	(2.028)	(2.162)
log(ME)	-0.309***	-0.267***	-0.308***	-0.269***	-0.264***
	(-8.537)	(-3.965)	(-8.665)	(-7.287)	(-4.019)
log(BE/ME)	-0.022	0.120	-0.030	0.039	0.109
	(-0.321)	(1.506)	(-0.435)	(0.615)	(1.284)
RET	0.001	0.004	0.001	-0.008	0.005
	(0.286)	(0.392)	(0.270)	(-1.165)	(0.417)
RET[t-12,t-1]	-0.001	-0.000	-0.002	-0.001	-0.001
	(-0.398)	(-0.054)	(-0.516)	(-0.455)	(-0.132)
AMIHUD	0.707	0.055	0.720	0.273	-0.210
	(1.598)	(0.095)	(1.513)	(0.759)	(-0.418)
SPREAD	0.973	1.546	0.711	0.411	1.307
	(1.206)	(1.474)	(0.877)	(0.503)	(1.243)
VOLATILITY	0.064	0.060	0.054	0.055	0.059
	(0.550)	(0.355)	(0.464)	(0.528)	(0.345)
ΔTURNOVER	-0.079	-0.107	-0.094	-0.084	-0.090
	(-0.433)	(-0.469)	(-0.490)	(-0.462)	(-0.367)
Population			0.006		
			(1.643)		
GDP per capita			-0.005*		
			(-1.976)		
State portfolio return			0.011		
			(0.655)		
Fixed effects	state	state	no	industry	no
R-squared	0.131	0.166	0.061	0.265	0.117

Note: Fama-MacBeth (1973) regressions in which the dependent variable is the DGTW characteristic-adjusted abnormal return in regressions (1), (3), and (4), the state-portfolio adjusted return in regression (2) and the raw return on the stock in (5), all evaluated in month t+1. This table checks the robustness of the main results of the paper to state and industry effects, benchmarking returns against state portfolios, and the use of raw returns. *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-12,t-1] is the cumulative return of the stock between t-12 and t-1; AMIHUD is the illiquidity 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. The first two regressions control for state fixed effects. Regression (3) controls for state GDP per capita, state population, and the return on the state portfolio. State portfolios are constructed as value-weighted portfolios of the stocks of S&P 500 firms headquartered in each U.S. state. State-portfolio adjusted returns in regression (2) are calculated as the return on the stock minus the return on the corresponding state portfolio. The fourth equation controls 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: Portfolios Triple Sorted by Size, Remote Location, and Abnormal Asymmetric Attention

Jensen's Alphas of Portfolios				
Large firms		Low-asym	High-asym	High - Low
Remote stocks	EW excess returns	-0.06	0.13	0.19
	VW excess returns	0.46***	0.77***	0.31
Metro stocks	EW excess returns	0.10	0.32**	0.22
	VW excess returns	0.27	0.67***	0.40
Difference	EW excess returns			-0.03
remote vs. metro	VW excess returns			-0.09

Small firms		Low-asym	High-asym	High - Low
Remote stocks	EW excess returns	0.09	0.64***	0.55**
	VW excess returns	0.68***	1.36***	0.67**
Metro stocks	EW excess returns	0.71***	0.70***	-0.02
	VW excess returns	1.41***	1.26***	-0.15
Difference	EW excess returns			0.57*
remote vs. metro	VW excess returns			0.82**

Note: Jensen's alphas for portfolios triple sorted according to size, remote location, and *abnormal asymmetric attention*. *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 firm is headquartered and the 21 most populated cities in the U.S. Each month, we sort stocks into two groups based on size (above/below median), and then within these groups further into terciles based on remote location. In each of these size-remote location cells, we then form the following three portfolios based on *abnormal asymmetric attention*: i) the high-asymmetry portfolio consists of stocks with Relative ASVI above the 80th percentile; ii) the low-asymmetry portfolio consists of stocks with Relative ASVI below the 20th percentile; iii) long-short portfolio is a zero-investment portfolio that longs high-asymmetry stocks and shorts low-asymmetry stocks. We form these three portfolios for every size-remote location cell 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 (1993) factors, the Carhart (1997) momentum factor and the Pastor and Stambaugh (2003) 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 third remote location terciles both for large and for small firms. In both the large and the small firm groups, we test whether the long-short portfolio alphas are significantly different in remote vs. metro stocks. We show the results of these tests below the portfolio alphas in both the top and the bottom panel of the table. The symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 7: Portfolios Triple Sorted by Size, Bid-ask Spreads, and Abnormal Asymmetric Attention

Jensen's Alphas of Portfolios				
Large firms		Low-asym	High-asym	High - Low
High bid-ask spread	EW excess returns	-0.16	0.25*	0.41
	VW excess returns	0.26	0.97***	0.70**
Low bid-ask spread	EW excess returns	0.07	0.16	0.09
	VW excess returns	0.46**	0.46**	0.00
Difference high vs. low	EW excess returns			0.32
	VW excess returns			0.70*

Small firms		Low-asym	High-asym	High - Low
High bid-ask spread	EW excess returns	0.10	1.01***	0.91**
	VW excess returns	1.19***	1.88***	0.69*
Low bid-ask spread	EW excess returns	0.48***	0.70***	0.22
	VW excess returns	0.93***	1.25***	0.32
Difference high vs. low	EW excess returns			0.69*
	VW excess returns			0.37

Note: Jensen's alphas for portfolios triple sorted according to size, remote location, and *abnormal asymmetric attention*. *Abnormal asymmetric attention* is the difference between *local abnormal attention* and *national abnormal attention*. *Bid-ask spread* is the proportional quoted bid-ask spread from CRSP. Each month, we sort stocks into two groups based on size (above/below median), and then within these groups further into terciles based on bid-ask spreads. In each of these size-bid-ask-spread cells, we then form the following three portfolios based on *abnormal asymmetric attention*: i) the high-asymmetry portfolio consists of stocks with Relative ASVI above the 80th percentile; ii) the low-asymmetry portfolio consists of stocks with Relative ASVI below the 20th percentile; iii) long-short portfolio is a zero-investment portfolio that longs high-asymmetry stocks and shorts low-asymmetry stocks. We form these three portfolios for every size-bid-ask-spread cell 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 (1993) factors, the Carhart (1997) momentum factor and the Pastor and Stambaugh (2003) 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 third bid-ask spread terciles both for large and for small firms. In both the large and the small firm groups, we test whether the long-short portfolio alphas are significantly different in firms with high vs. low bid-ask spreads. We show the results of these tests below the portfolio alphas in both the top and the bottom panel of the table. The symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 8: Portfolios Triple Sorted by Size, Analyst Forecast Dispersion, and Abnormal Asymmetric Attention

Jensen's Alphas of Portfolios				
Large firms		Low-asym	High-asym	High - Low
High forecast dispersion	EW excess returns	-0.22	-0.35	-0.13
	VW excess returns	0.26	0.24	-0.02
Low forecast dispersion	EW excess returns	0.20	0.53***	0.33
	VW excess returns	0.60***	0.87***	0.28
Difference high vs. low	EW excess returns			-0.42
	VW excess returns			-0.34

Small firms		Low-asym	High-asym	High - Low
High forecast dispersion	EW excess returns	-0.09	0.90**	0.99**
	VW excess returns	0.72**	2.06***	1.34***
Low forecast dispersion	EW excess returns	0.71***	0.51**	-0.20
	VW excess returns	1.04***	0.98***	-0.06
Difference high vs. low	EW excess returns			1.19***
	VW excess returns			1.40***

Note: Jensen's alphas for portfolios triple sorted according to size, analyst forecast dispersion, and *abnormal asymmetric attention*. *Abnormal asymmetric attention* is the difference between *local abnormal attention* and *national abnormal attention*. *Analyst forecast dispersion* is the standard deviation of earnings forecasts scaled by the absolute value of the mean earnings forecast. Each month, we sort stocks into two groups based on size (above/below median), and then within these groups further into terciles based on analyst forecast dispersion. In each of these size-forecast-dispersion cells, we then form the following three portfolios based on *abnormal asymmetric attention*: i) the high-asymmetry portfolio consists of stocks with Relative ASVI above the 80th percentile; ii) the low-asymmetry portfolio consists of stocks with Relative ASVI below the 20th percentile; iii) long-short portfolio is a zero-investment portfolio that longs high-asymmetry stocks and shorts low-asymmetry stocks. We form these three portfolios for every size-forecast-dispersion cell 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 (1993) factors, the Carhart (1997) momentum factor and the Pastor and Stambaugh (2003) 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 third bid-ask spread terciles both for large and for small firms. In both the large and the small firm groups, we test whether the long-short portfolio alphas are significantly different in firms with high vs. low analyst forecast dispersion. We show the results of these tests below the portfolio alphas in both the top and the bottom panel of the table. The symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 9: Abnormal Asymmetric Attention and Reversals in Stock Returns

End month	t+1	t+2	t+3	t+4	t+5	t+6	t+7	t+8	t+9	t+10	t+11	t+12
Regression	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Abnormal asymmetric attention	0.140***	0.196***	0.242***	0.210**	0.213*	0.195	0.260*	0.242	0.240	0.257	0.246	0.162
	(2.641)	(2.753)	(3.018)	(2.111)	(1.793)	(1.556)	(1.848)	(1.534)	(1.426)	(1.475)	(1.376)	(0.884)
log(ME)	-0.305***	-0.602***	-0.862***	-1.129***	-1.424***	-1.696***	-1.985***	-2.257***	-2.545***	-2.823***	-3.117***	-3.406***
	(-8.819)	(-11.015)	(-12.039)	(-13.082)	(-13.901)	(-14.130)	(-14.781)	(-14.773)	(-14.889)	(-15.173)	(-15.643)	(-16.292)
log(BE/ME)	-0.029	-0.083	-0.102	-0.147	-0.242	-0.389*	-0.541**	-0.711***	-0.892***	-1.124***	-1.345***	-1.471***
	(-0.416)	(-0.741)	(-0.733)	(-0.908)	(-1.308)	(-1.839)	(-2.329)	(-2.670)	(-2.961)	(-3.391)	(-3.676)	(-3.719)
RET	0.002	-0.002	-0.008	-0.005	0.013	0.018	0.015	0.013	0.018	0.014	0.040	0.040
	(0.419)	(-0.157)	(-0.647)	(-0.309)	(0.712)	(0.807)	(0.637)	(0.500)	(0.608)	(0.483)	(1.274)	(1.223)
RET[t-12,t-1]	-0.002	-0.003	-0.002	-0.001	-0.003	-0.004	-0.003	-0.002	-0.001	0.000	0.002	0.004
	(-0.476)	(-0.476)	(-0.306)	(-0.164)	(-0.346)	(-0.352)	(-0.297)	(-0.195)	(-0.092)	(0.037)	(0.123)	(0.317)
AMIHUD	0.356	0.368	0.491	0.899	1.981	2.621*	4.488**	6.847***	9.373***	12.468***	15.061***	17.831***
	(0.963)	(0.627)	(0.514)	(0.805)	(1.557)	(1.941)	(2.507)	(2.878)	(3.093)	(3.614)	(3.983)	(4.479)
SPREAD	0.721	0.624	1.097	0.524	-0.421	0.459	-0.200	-0.607	-0.660	0.624	0.920	1.249
	(0.900)	(0.578)	(0.763)	(0.319)	(-0.230)	(0.229)	(-0.088)	(-0.262)	(-0.292)	(0.285)	(0.419)	(0.542)
VOLATILITY	0.063	0.084	0.103	0.224	0.241	0.270	0.436	0.634*	0.717*	0.786*	0.956**	1.086**
	(0.538)	(0.503)	(0.520)	(0.975)	(0.904)	(0.882)	(1.304)	(1.805)	(1.881)	(1.917)	(2.190)	(2.303)
ΔTURNOVER	-0.087	-0.196	-0.018	-0.232	-0.200	-0.314	-0.716	-0.896*	-0.537	-0.696	-1.063*	-0.755
	(-0.446)	(-0.830)	(-0.061)	(-0.688)	(-0.534)	(-0.728)	(-1.518)	(-1.901)	(-1.028)	(-1.208)	(-1.814)	(-1.209)
R-squared	0.052	0.059	0.061	0.065	0.068	0.073	0.075	0.077	0.081	0.083	0.086	0.089

Note: Monthly Fama-MacBeth (1973) regressions from January 2004 to December 2013. The dependent variable is the cumulative DGTW characteristic-adjusted abnormal return from month t+1 to the month shown in the column heading (t+2, t+3, etc.). *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, and are winsorized at the 1st and the 99th percentile. 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-12,t-1] is the cumulative return of the stock between t-12 and t-1; AMIHUD is the illiquidity 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 symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.

Table 10: Abnormal Asymmetric Attention and Reversals in Stock Returns – Monthly Returns

Month	t+1	t+2	t+3	t+4	t+5	t+6	t+7	t+8	t+9	t+10	t+11	t+12
Regression	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Abnormal asymmetric attention	0.140***	0.049	0.055	-0.033	0.003	0.008	0.079	0.019	0.011	0.011	-0.041	-0.074
	(2.641)	(0.995)	(1.237)	(-0.720)	(0.066)	(0.158)	(1.623)	(0.342)	(0.196)	(0.272)	(-0.769)	(-1.544)
log(ME)	-0.305***	-0.296***	-0.259***	-0.260***	-0.279***	-0.256***	-0.281***	-0.264***	-0.271***	-0.270***	-0.291***	-0.272***
	(-8.819)	(-8.382)	(-7.229)	(-7.323)	(-7.219)	(-6.596)	(-7.238)	(-6.531)	(-6.404)	(-6.002)	(-6.400)	(-5.986)
log(BE/ME)	-0.029	-0.066	-0.035	-0.061	-0.104	-0.156**	-0.157*	-0.169**	-0.188**	-0.213**	-0.196***	-0.131*
	(-0.416)	(-0.885)	(-0.469)	(-0.840)	(-1.410)	(-1.999)	(-1.943)	(-1.986)	(-2.164)	(-2.364)	(-2.917)	(-1.852)
RET	0.002	-0.004	-0.008	0.002	0.017**	0.000	-0.003	-0.000	0.002	-0.002	0.027***	-0.001
	(0.419)	(-0.447)	(-0.959)	(0.242)	(2.151)	(0.007)	(-0.397)	(-0.008)	(0.295)	(-0.261)	(4.055)	(-0.117)
RET[t-12,t-1]	-0.002	-0.001	0.001	0.001	-0.002	-0.000	0.001	0.001	0.001	0.002	0.001	0.003
	(-0.476)	(-0.384)	(0.197)	(0.252)	(-0.735)	(-0.167)	(0.278)	(0.525)	(0.624)	(1.043)	(0.506)	(1.258)
AMIHUD	0.356	-0.056	0.028	0.328	0.763	0.442	1.194*	1.545*	1.748**	1.668***	1.492*	1.115
	(0.963)	(-0.136)	(0.049)	(0.810)	(1.473)	(0.847)	(1.915)	(1.912)	(2.013)	(2.677)	(1.768)	(1.594)
SPREAD	0.721	-0.081	0.408	-0.392	-0.982	1.027	-0.231	-0.015	0.573	1.434*	0.358	0.364
	(0.900)	(-0.116)	(0.551)	(-0.527)	(-1.244)	(1.289)	(-0.279)	(-0.020)	(0.734)	(1.744)	(0.476)	(0.417)
VOLATILITY	0.063	0.013	0.020	0.099	0.032	0.006	0.102	0.154	0.073	0.032	0.142	0.147
	(0.538)	(0.117)	(0.176)	(0.936)	(0.274)	(0.053)	(0.928)	(1.305)	(0.603)	(0.258)	(1.137)	(1.210)
ΔTURNOVER	-0.087	-0.141	0.206	-0.179	-0.091	-0.013	-0.392**	-0.274	0.468***	-0.152	-0.443***	0.260
	(-0.446)	(-0.841)	(1.101)	(-1.018)	(-0.491)	(-0.067)	(-2.563)	(-1.554)	(2.634)	(-0.953)	(-2.643)	(1.370)
R-squared	0.052	0.058	0.055	0.053	0.052	0.055	0.051	0.05	0.051	0.05	0.05	0.052

Note: Monthly Fama-MacBeth (1973) regressions from January 2004 to December 2013. The dependent variable is the DGTW characteristic-adjusted abnormal return in the month shown in the column heading (t+1, t+2, t+3, etc.). *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, and are winsorized at the 1st and the 99th percentile. 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-12,t-1] is the cumulative return of the stock between t-12 and t-1; AMIHUD is the illiquidity 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 symbols ***, **, and * denote that the individual coefficient is significant at the 1%, 5%, and 10% significance level, respectively.