DISCUSSION PAPER SERIES

No. 8969

LOCAL BIAS AND STOCK MARKET CONDITIONS

Mariassunta Giannetti and Luc Laeven

FINANCIAL ECONOMICS

Centre for Economic Policy Research

www.cepr.org

Available online at: www.cepr.org/pubs/dps/DP8969.asp

ISSN 0265-8003

LOCAL BIAS AND STOCK MARKET CONDITIONS

Mariassunta Giannetti, Stockholm School of Economics and CEPR
Luc Laeven, International Monetary Fund (IMF) and CEPR

Discussion Paper No. 8969
May 2012

Centre for Economic Policy Research
77 Bastwick Street, London EC1V 3PZ, UK
Tel: (44 20) 7183 8801, Fax: (44 20) 7183 8820
Email: cepr@cepr.org, Website: www.cepr.org

CEPR Discussion Paper No. 8969

May 2012

ABSTRACT

Local Bias and Stock Market Conditions*

We show that the local bias in U.S. mutual fund portfolios varies significantly over time and is more pronounced at times of heightened market uncertainty, such as during financial crises. Similarly, the local bias is less pronounced in periods when market sentiment is strong. These results do not depend on past fund performance or fund inflows during good times. Additionally, we do not find that fund managers earn superior returns on local stocks during periods of heightened market uncertainty. Overall, we conclude that informational advantages or scale economies are unlikely to be important factors in explaining the dependence of local bias on market conditions, and that our evidence is more consistent with a behavioral explanation whereby changes in market conditions affect the preference for local stocks of ambiguity averse investors.

JEL Classification: E32
Keywords: behavioral finance, financial cycles, home bias, institutional investors, investor sentiment, local bias, market uncertainty, mutual funds and stock market

Mariassunta Giannetti
Department of Finance
Stockholm School of Economics
Sveavägen 65, Box 6501
SE-113 83 Stockholm
SWEDEN
Email: mariassunta.giannetti@hhs.se

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=147797

Luc Laeven
Research Department
International Monetary Fund
700 19th Street, N.W
Washington, DC 20431
USA
Email: llaeven@imf.org

For further Discussion Papers by this author see:
www.cepr.org/pubs/new-dps/dplist.asp?authorid=155503

* We thank Harrison Hong, Charles Jones, Bige Kahraman, Veronika Krepely Pool and seminar participants at IESE for useful discussions and comments, Jeanne Verrier for excellent research assistance, Malcolm Baker and Jeffrey Wurgler for kindly sharing their sentiment index data, and Russ Wermers for kindly sharing the stock assignments and benchmark portfolio returns to adjust stock returns for risk. Giannetti acknowledges financial support from the Jan Wallander and Tom Hedelius Foundation and the Bank of Sweden Tercentenary Foundation. The views presented in this paper are those of the authors and should not be attributed to or reported as reflecting the position of the IMF, or its Executive Directors.

Submitted 01 May 2012

1. Introduction

An important paper by Coval and Moskowitz (1999) shows that investment managers overweigh the stocks of geographically close firms and exhibit a local bias in their portfolios. To the best of our knowledge, however, there exists no evidence on whether the local bias of fund managers' portfolios varies depending on market conditions. This is important not only to identify which theories can explain the local bias of investors' portfolios and, more broadly, the home bias, but also to understand how investment managers use information in selecting their investments and how they attempt to add value for their clients.

In this paper, we investigate whether and to what extent the local bias varies depending on market conditions and whether the changes in local bias are justified by changes in the managers' ability to predict the returns of local and distant stocks. We show that the local bias of fund managers' portfolios is higher when fear and uncertainty in the market increase, as captured by increases in the CBOE Volatility Index (VIX) measuring innovations in market-wide implied volatility. Similarly, the local bias is less pronounced in periods of strong market sentiment, which we measure as in Baker and Wurgler (2006, 2007). Figure 1 vividly summarizes these patterns: the average distance between the stocks' headquarters and the mutual fund tends to drop sharply when the VIX index spikes.

These findings could be consistent with two alternative sets of theories. On the one hand, the local bias may derive from the fact that fund managers have an informational advantage for local stocks (Brennan and Cao, 1997). In this case, an increase in local bias during bad times implies that the informational advantage becomes more important, and may improve the portfolio performance to a larger extent, when market conditions deteriorate, possibly because the severity of shocks that may affect firms' fundamentals increases.

On the other hand, fund managers may have less precise information on the distribution of the returns of distant stocks and may therefore perceive them as riskier. The experiments of Heath and Tversky (1991) suggest that when the probability of making losses is high, precisely like during periods of heightened market uncertainty, agents prefer to take risks about which they feel more knowledgeable. Barberis (forthcoming) argues that, under these conditions, even professional asset managers employed by institutional investors prefer to operate in more familiar environments.

The consequences of these views for portfolio allocation have been formalized using ambiguity aversion. Epstein (2001) shows that ambiguity aversion may generate home bias. Furthermore, Garlappi, Uppal, and Wang (2007) and Boyle et al. (2012) show that an increase in the volatility of (both local and distant) stocks may generate an increase in the local bias for ambiguity averse investors.

To discern between these potential explanations of our findings, we explore the ex post performance of the portfolios of local and distant stocks. Similarly to Coval and Moskowitz (2001) and Bae, Kang and Lim (2002), we find that fund managers earn superior returns on average on their investments in local stocks, which indicates that they enjoy an informational advantage on proximate investments. However, this informational advantage of fund managers (as measured by excess returns of local stocks relative to distant stocks) appears to be weaker and even disappears during periods with high market uncertainty, which is precisely when fund managers concentrate their portfolios on local investments. Thus, the increased concentration of mutual fund portfolios in local stocks at times of heightened market uncertainty does not appear to be information driven. Rather, market conditions affect whether managers want to bear higher perceived risk of distant stocks or not.

As an alternative interpretation of our findings, we consider the possibility that our results are driven by changes in the scale of funds. In particular, fund managers may have stock picking abilities that may plausibly involve the stocks of proximate firms. Chen, Hong, Huang and Kubik (2004) show that when the scale of the fund increases due to net flows, the fund manager has to expand the set of investment to her no-so-good ideas, which in our case may involve the stocks of more distant firms. To the extent that mutual funds experience larger inflows and better performance during good times, such a mechanism could explain why the local bias decreases during periods of strong market sentiment.

To evaluate the merit of this alternative explanation, we test whether mutual funds invest in distant stocks to a larger extent, after experiencing better performance and larger net flows and, more importantly, whether these alternative channels eliminate the effect of market conditions on the funds' propensity to invest in distant stocks. We find that net flows and previous performance do not help explain the changing geography of mutual funds investment. Crucially, we continue to find that managers decrease their portfolio shares in distant stocks when market conditions deteriorate and uncertainty looms, as captured by an increase in the VIX index. This result attains also if we control for the logarithm of the funds' total net assets under management (TNA) or for the number of positions that the funds hold. Hence, we can conclude that our findings are unrelated to the fund's scale.

Overall, it appears that explanations relying on informational advantages or scale economies are unlikely to be important drivers of the variation in local bias due to changes in market conditions. Our evidence is more consistent with a behavioral explanation whereby changes in market conditions affect the preference for local stocks of ambiguity averse investors.

Our work is related to a vast literature on home and local biases in the allocation of capital (French and Poterba, 1991; Lewis, 1999). The presence of home bias has been documented across countries with diverse institutional environments (Chan et al., 2005) and within countries because investors exhibit a preference for geographically close assets (Coval and Moskowitz, 1999, 2001; Grinblatt and Keloharju, 2001). Theory offers alternative explanations for the existence of such preference for local stocks, including informational advantages for local investors (Brennan and Cao, 1997; Ahearne et al., 2004; Portes and Rey, 2005; Kang and Stulz, 1997; Van Nieuwerburgh and Veldkamp, 2009) and biases arising from familiarity considerations (Grinblatt and Keloharju, 2000; Huberman, 2001; Seasholes and Zhu, 2010).[1]

While the presence of a bias toward local stocks has been well documented, little is known about whether such local bias changes over time. We are the first to show that local biases vary over time depending on stock market conditions. Several other papers have explored how the behavior of investors changes over time and depend on economic conditions but all of these studies are cast in an international context and, most importantly, none of these studies considers the importance of stock market conditions for the home bias. For instance, Bohn and Tesar (1996) and Kim and Wei (2002) show that U.S. investors chase returns when they allocate their international equity portfolio, while Curcuru et al. (2011) question these findings. Gelos and Wei (2005) find that global emerging market funds have a greater propensity to exit nontransparent countries during crises affecting those countries. In

[1] While transaction costs could in theory explain a home bias in investments, such explanation is less relevant in our context because our focus is on mutual fund investments in US stocks, which can be traded at low and similar cost independent of location.

a macroeconomic analysis of international capital flows, Forbes and Warnock (2011) show that global risk factors play an important role in the allocation of global capital with capital retrenching to home markets at times of heightened global risk. However, given their macroeconomic focus, Forbes and Warnock are unable to draw inference about individual investor behavior and changes in home bias.

Recent work by Giannetti and Laeven (2012a and b) on lending behavior of banks in the global syndicated loan market suggests that the home bias of lenders may depend on market conditions. However, they study lenders that naturally acquire private information on their borrowers in the course of the relationship lending process, not investors that operate more at arms' length.[2] To the best of our knowledge, no paper has considered how home and local biases depend on market conditions in the equity market and how the changes in biases are related to investor performance as we do.

The paper proceeds as follows. Section 2 presents the data used in this paper, including information on the characteristics and holdings of U.S. mutual funds, market conditions, and stock characteristics. Section 3 analyzes how the portfolio choice between local and distant stocks varies with market conditions. Section 4 examines the relationship between geographical distance and investment performance among mutual fund managers over time. Section 5 concludes.

[2] Giannetti and Laeven (2012a) show that lenders exhibit a more pronounced home bias during financial crises, especially when their capital positions are hit by domestic financial shocks, which they interpret as evidence that the home bias varies over time depending on the net wealth of investors. Furthermore, Giannetti and Laeven (2012b) show that banks tend to extend more syndicated loans to foreign borrowers when stock valuations are high in their country of origin.

2. Data and Descriptive Statistics

2.1 Mutual Fund Portfolios

Our sample combines several data sources. From the Thomson-Reuters Mutual Fund Holdings database (formerly known as CDA/Spectrum), we obtain the quarter-end holdings reported by U.S.-based mutual funds in mandatory SEC filings. Reported securities include all NYSE/AMEX/NASDAQ common stocks.

The second mutual fund dataset is the Center for Research in Security Prices (CRSP) survivorship bias-free mutual fund database, which contains information on mutual funds' monthly net returns, net asset under management as well as the address of the mutual fund's management company, which we use to identify the mutual fund's location.

We use the MFLINKS tables developed by Russ Wermers and accessible through Wharton Research Data Services (WRDS) to join the CRSP mutual fund information to the equity holdings data in Thomson-Reuters Mutual Fund Holdings. We drop mutual funds with no match in the MFLINKS tables. We only keep funds with at least five equity holdings.

Since we want to concentrate on the U.S. holdings of the U.S. actively managed equity mutual funds, we remove the holdings of firm headquartered outside the United States. We further use Morningstar style classification to exclude funds whose main objective is to invest in bonds, international equities or that are specialized in particular industries, as industry specialization may lead to geographical concentration for reasons that are different from the one we want to study. Finally, we remove index funds by screening mutual funds' names, and eliminating any fund whose name contains the word "index", or some variant thereof, as is common in the literature (see, for instance, Kacperczyk, Sialm and Zheng, 2005).

With all these exclusions, our final sample includes 3,454 actively managed equity funds. Table 1 provides summary statistics on the main funds' characteristics. Our main variable of interest is the fund *j*'s portfolio share in firm *i* during quarter *t*, defined as the value of the stockholding of fund *j* in firm *i*, computed using firm *i*'s stock price at the end of quarter *t* divided by the value of all stockholdings of fund *j*, also computed using stock prices at the end of quarter *t*. Since the funds in our sample are highly diversified, the average portfolio share in our sample is less the 1%.

While the portfolio share of fund *j* depends on stock prices, we explore the robustness of our results by considering the effect of market conditions on funds' purchases and sales of local and distant stocks. Since purchases and sales are defined as changes in the number of shares in the fund's portfolio, they are unaffected by variation in the price of stocks.

2.2 Market Conditions

Our main proxy for market conditions is the VIX index, a measure of implied volatility in S&P500 index options, widely used to capture fear in the market (see, for instance, Adrian and Shin (2010)). The VIX index is increasing in volatility and available since 1990. Prior to 1990, the VXO index offers a measure of implied volatility in S&P100 index options, which is comparable to the VIX index. We obtain monthly price data on the VIX and VXO indices from the Chicago Board Options Exchange (CBOE), the largest U.S. options exchange. In our analysis, we use the VXO index. Results are unaltered when we use the VIX index for observations starting in 1990 and the VXO for pre-1990 observations. In what follows, as is common in the literature, we refer to the VXO index as the VIX index.

As alternative proxy for market conditions, we use the monthly market sentiment index from Baker and Wurgler (2006), which is a composite index of market sentiment based on common variation in six underlying proxies for sentiment: the closed-end fund discount, NYSE share turnover, the number and average first-day returns on IPOs, the equity share in new issues, and the dividend premium. Specifically, sentiment is based on the first principal component of the above six (standardized) sentiment proxies, where each of the proxies has first been orthogonalized with respect to a set of macroeconomic conditions.[3] Baker and Wurgler (2006) show that this index captures well fluctuations in market sentiment, with the index increasing in sentiment.

The VIX and market sentiment index are complementary measures of market conditions because volatility, as measured by the VIX, has been shown to be asymmetric in equity markets, with volatility being much higher following negative return shocks than following positive return shocks of the same magnitude (see, for example, Bekaert and Wu, 2000). This implies that VIX may be a better proxy for weak market conditions than for strong market conditions, and in particular that a low value of VIX need not necessarily signal strong market conditions. The market sentiment index does not have this characteristic. For this reason, we regard the market sentiment index as complimentary to the VIX index, and use the market sentiment index as our main proxy for market conditions especially in regression specifications in which we want to explore the behavior of fund managers during good times. However, throughout the analysis, we assess whether results are robust to the use of both measures of market conditions.

2.3 Stock Characteristics and Distance Measures

[3] The sentiment index data is kindly made available by Malcolm Baker and Jeffrey Wurgler via their website at: http://people.stern.nyu.edu/jwurgler/data/Investor_Sentiment_Data_v23_POST.xlsx. We report results using the orthogonalized version of the sentiment index (equation (3) in their paper) but our results are unaltered when using the standard version of the sentiment index.

We obtain information on monthly stock returns of U.S. stocks from CRSP. To explore the relative ability of fund managers to predict the returns of local and distant stocks, we match the quarterly domestic equity holdings of the mutual funds with monthly stock returns.

From COMPUSTAT, we obtain information on firm characteristics, such as return on assets, leverage (ratio of debt to total assets), and book value of equity. We also use Compustat to determine the geographical location of each stock, proxied by the 5-digit zipcode of the headquarters of the underlying firm. We use the U.S. Postal Services classification of U.S. zipcodes and obtain information on the geographical longitude and latitude of each zipcode (both in decimal degrees) to express the location of each zipcode. We combine this information on the location of each stock with the information from CRSP on the zipcode of the headquarters of each mutual fund's management company to measure the distance between each stock and the investment manager. Following Coval and Moskowitz (2001), we compute the great-circle distance, d_{ij} between fund i and the headquarters of each firm j it holds as:

$$d_{ij} = \frac{2\pi r}{360} \arccos(\cos(lat_i)\cos(lat_j)\cos(lon_i - lon_j) + \sin(lat_i)\sin(lat_j)), \quad (1)$$

where *lat* and *lon* are fund and company latitudes and longitudes in decimal degrees, and r is the radius of the earth, set equal to 6,378 kilometers.

As illustrated by Figure 1, the average distance between each stock's headquarters and mutual fund increases gradually over our sample period, from 1,540 kilometers at the beginning of 1980 to 1,791 kilometers at end-2009. Funds have been increasingly investing in distant stocks, possibly due to improvements in the information technology and regulation reducing the extent of asymmetric information (Bernile, Kumar and Sulaeman, 2011). However, importantly for our purposes, distance varies greatly over time, with distance dropping sharply at times when market volatility increases, and with distance increasing again when market sentiment turns around and improves.

For example, during the last quarter of 1987, following the stock market crash of October 1987, which coincided with a sharp increase in the VIX stock market volatility index from 20 to 49 at the end of the quarter, the average distance decreased from 1,568 to 1,554 kilometers, after having increased sharply during the preceding quarters. Similarly, distance decreased markedly during the period 1997-98 when emerging market crises in East Asia and the collapse of LTCM added to stock market volatility. Distance then reached a high of 1,765 kilometers during the first quarter of 2001, only to reduce sharply to 1,711 kilometers at the end of the third quarter of 2002 as the stock market bubble in technology stocks burst. Average distance then dropped by 40 kilometers from an all-time high of 1,784 kilometers in the first quarter of 2006 to a low of 1,744 kilometers at the peak of the subprime crisis in the third quarter of 2008, when VIX jumped to all-time highs, more than quadrupling from 12 points in early 2006 to 54 points at the end of 2008. Overall, there appears to be a strong relation between distance and stock market volatility in the data.

Similarly to Coval and Moskowitz (2001), we classify any stock within 100 kilometers of the mutual fund's headquarters as a local stock. As the average distance increases during periods of high stock market volatility, we expect that local ownership of mutual funds (i.e., the fraction of mutual fund assets invested in local stocks) increases, while the opposite is true when stock market volatility is at low levels. Following Coval and Moskowitz (2001), we consider a stock local if the fund is located within 100 kilometers of stock j's headquarters. We compute local ownership of stock j as the fraction of total mutual fund dollars invested in stock j that are provided by funds located within 100 kilometers of stock j's headquarters, while deducting the fraction of mutual fund assets that are within 100 kilometers of stock j's headquarters. The average local ownership across stocks computed this way is pretty stable over time, ranging between 6.4 and 8.2 percent over the period 1980 to 2009 and averaging 7.3 percent over the sample period. However, there is much variation in local ownership across stocks, with about half of firms having no local ownership at some point in time and about 5% of firm-quarterly observations having more than 50% local ownership. For firms that are predominantly held by local funds (i.e., firms with positive local ownership), local ownership decreases on average from 39% in 1980 to 17% in 2009, consistent with the increase in average distance of shareholdings displayed in Figure 1. More importantly, we indeed find that local ownership varies strongly with market conditions, consistent with panel B in Figure 1. For example, over the post-1999 period, the correlation between the VIX index and the weighted-average local ownership (weighted by the value of total mutual fund holdings and computed for firms with positive local ownership) is positive and high at 0.31.

We also use an alternative definition of local stocks widely used in the literature (e.g., Bae, Kang and Lim, 2002), which relies on the state of incorporation of the firm and the fund manager. Since arguably many of the interactions and most of the local news revolve within the state, all stocks of firms with headquarters in the same state as the fund are considered as local. Moreover, the land size of U.S. states varies considerably such that a distance of 100 kilometers is relatively large for some states but small for others.

In what follows, we ascertain that any results are robust to the use of these alternative proxies as well as to the use of the continuous measure of distance.

3. Mutual Fund Portfolios, Local Holdings, and Market Conditions

3.1 Methodology

To explore how the choice between local and distant stocks varies with market conditions, we model the portfolio share of fund j in firm i during quarter t as a function of alternative proxies for physical proximity between the firm's headquarters and the investment manager. Importantly, we test whether the effect of proximity varies with market conditions, which we capture using the VIX index or a proxy for market sentiment.

We estimate the following equation:

$$Share_{ijt} = \alpha_j + \beta_1 Proximity_{ij} + \beta_2 Proximity_{ij} \times Market\ conditions_t$$
$$+\Gamma X_{ijt} + \varepsilon_{ijt}, \qquad (2)$$

Based on existing literature, we expect that $\beta_1 > 0$, as fund managers tend to invest a larger share of their portfolios in the stocks of proximate firms (e.g., Coval and Moskowitz, 2001). Our main interest is in testing how the impact of proximity varies with market conditions as captured by β_2. Throughout our analysis we include fund fixed effects, α_j , because funds vary systematically in the extent of diversification of their portfolios, either because of size effects or because of investment strategies based on sectoral or regional focus. We further control for a number of firm and fund characteristics, which include proxies for fund size, the weight of firm i in the market portfolio at the end of quarter t, or in some specifications the weight of firm i at the end of quarter t in the aggregate portfolio of funds that share the same style as fund j.

The set of funds in the sample increases sharply during the sample period. However, since we include fund fixed effects, our estimates rely only on within-fund variation and cannot depend on changes over time in the composition of funds.

Furthermore, since we focus on the percentage of the portfolio that a fund manager allocates to different stocks, our dependent variable is unaffected by shocks that influence the size of the fund's portfolio, but leave unchanged the portfolio allocation.

Finally, we cluster errors at the fund-quarter level because the portfolio shares of a fund at a given date are not independent.

3.2 Main Results

Table 2 relates the distance between the fund manager and the firm's headquarters to the manager's portfolio shares. Most importantly, it shows how the effect of distance varies with market conditions. In column 1 of Table 2, our estimates indicate that when the VIX increases, denoting heightened market uncertainty, fund managers decrease their holdings in distant stocks to a larger extent. When the VIX is at the minimum of our sample, an increase in distance between the fund manager and the firm's headquarters of 1,000 km corresponds to a decrease in the fund manager's shareholding of the stock of about 0.01% when evaluated at the median. Importantly, the same increase in distance translates in a decrease in the portfolio share of 7.5% when the VIX approaches the top percentile of our sample, which is a large effect compared to the sample median shareholding of 0.35%. The effects are similar if we use changes in market sentiment as proxy for market conditions (column 2). We naturally obtain opposite signs on the coefficient for market sentiment compared to the results using VIX, because the market sentiment obtains higher values when market conditions improve.

We then explore whether changes in the mutual funds industry may explain our findings. First, we control for each stock weight in the portfolio of mutual funds with the same style of the fund in question (columns 3 and 4). Second, we control for trends affecting the mutual funds industry by including a linear time trend and a quadratic time trend and by controlling for the total net assets under management of the mutual fund industry and its trend over time (column 5) and consider different sub-periods, including the 1990s and the 2000s (columns 6 and 7). Our results are invariant to these alternative specifications.

3.3 Fund Flows and Investments in Distant Stocks

In Table 3, we consider a potential alternative explanation for our findings. When their assets expand, funds may exhaust their best trading ideas, which plausibly involve mostly local stocks, and may expand to less proximate investments. It is also possible that larger funds have more resources for stock research and analysis, allowing them to incur the fixed cost of analyzing distant stocks and to expand their portfolio geographically to a larger extent. To consider these possibilities, we interact distance with the amount of net flows experienced by the fund during the previous quarter. We also interact distance with the fund's quarterly performance to allow for the possibility that performance is positively associated with contemporaneous net inflows. We find no evidence that changes in net asset under management are associated with a different geographic composition of the fund managers' portfolios (column 1). More importantly, we continue to find that an increase in VIX is associated with an increased concentration of the portfolio in close stocks.

Results are equally unchanged when we directly control for the scale of the fund either by including the logarithm of total net assets under management or the number of positions of the fund (column 2 and 3). This indicates that changes at the fund level, which may have increased the overall diversification of the fund manager's portfolio (thus decreasing all portfolio shares), are not driving our results.

3.4 Fund and Stock Characteristics

Our results so far indicate that when market conditions vary, funds tend to adjust their holdings of distant stocks. A possible concern is that this result is not driven by changes in the intensity of local bias, but rather by differences in the characteristics of local and distant stocks. This is unlikely because stocks that are local for some funds are distant for others. More importantly, our results do not alter when directly controlling for stock characteristics that may capture differences between close and local stocks, including the stock's market-to-book ratio, return on assets, liquidity (as measured by the stock trading volume), market capitalization, stock return during the previous quarter, market beta, and leverage (column 4 of Table 3). In particular, these results indicate that funds do not sell distant stocks to a larger extent when the VIX increases because distant stocks are more liquid on average.

Another possible concern is that market conditions may affect only marginal positions of the fund. While this would be broadly consistent with our findings, it would make the effects we highlight less important from an economic point of view. For this reason, we next concentrate on the effects of relatively large fund holdings. Specifically, we explore whether there is evidence that investments in proximate firms increase when market conditions worsen if we restrict the sample to stocks that constitute at least 0.2% of the fund portfolio (approximately the 20^{th} percentile of the distribution of fund asset weights). In column 1 of table 4, we continue to find that the effect of distance on portfolio holdings increases with market conditions when limiting the sample to relatively large fund holdings. In column 2, we restrict the sample to the top 10 positions of each fund. The effects of the interaction between distance and market conditions become even stronger.

More generally, we find that the local bias becomes more accentuated when market uncertainty looms, especially for funds with fewer positions in their portfolios, defined as funds with a number of positions below the top quartile during each year. Funds with concentrated portfolios are expected to engage in stock picking to a larger extent than other funds that holding highly diversified portfolios may mostly track an index even if they market themselves as active funds (Cremers and Petajisto, 2009). Thus, our findings appear to depend on the portfolio selection of actively managed funds, which in turn may be dictated either by risk or information considerations.

The effect on market conditions on local bias, however, does not depend on the type of stocks on which the fund invests. Using Morningstar's style classification, we identify funds whose objective it is to invest in small stocks. While these funds exhibit a stronger local bias, arguably because small are generally more opaque and it may be easier to collect information if these firms are closer in distance, the local bias varies with market conditions for these funds, as for the other funds in our sample. This suggests that changes in market conditions are unlikely to affect the local bias for information reasons, because in this case we should observe that funds investing in small capitalization stocks exhibit a stronger local bias when uncertainty in the market is higher, which we do not.

Instead, we find that the local bias becomes more accentuated when market conditions deteriorate, especially for firms with price volatility above its median. This may suggest that local bias may be driven by the desire to reduce risk in situations of high uncertainty. We provide more conclusive evidence on this issue in Section 4, where we compare the performance of the portfolio of local and distant stocks of each fund.

Finally, we assess whether local bias is dependent on whether or not funds are located in metropolitan areas where many local stocks are headquartered. We follow Coval and Moskowitz (1999) to classify funds by metropolitan location, separating funds into two categories: large cities (defined as funds located in any of the 20 most populated cities at each point in time) and small cities (defined as funds not located in any of the 20 most populated cities at each point in time). The list of the 20 largest populated cities in the U.S. at the beginning of each year is obtained from the U.S. Census Bureau. We find that funds in the top 20 U.S. cities, which presumably have more local stocks available given that listed companies tend to be headquartered in these cities, exhibit a stronger local bias on average. Furthermore, their local bias varies to a somewhat lower extent with market conditions.

3.5. Alternative Measures of Distance and Local Holdings

In Table 5, we use more discrete proxies for proximity. Regardless of whether we define close stocks as the stocks of firms whose headquarters are located within 100 km from the fund manager's location or as stocks of firms with headquarters in the same state of the fund manager, we continue to find that an increase in VIX is associated with a bias toward local stocks (columns 1 and 2).

The economic effects are substantial. Based on the coefficients in the regression in column 1 of Table 5, we find that a one standard deviation increase in VIX of 0.9 implies an increase in portfolio share of local stocks (as measured by those located within 100km of the fund manager) of 0.02%. This is significant compared to the median of the portfolio share of local stocks of 0.35%.

In the last two columns of Table 5, instead of relying on the continuous changes in portfolio shares, we study the probability that a fund sells stocks of a given firm when market uncertainty is high and buys stocks of distant firms in periods of strong sentiment. We continue to find that periods of high uncertainty are associated with less investment in distant stocks.

Overall, these findings confirm existing results in the literature of a strong bias for local stocks and, most importantly, provide strong evidence that this local bias increases during periods of heightened market uncertainty. Below we explore why market conditions affect the local bias. In particular, we conjecture that funds may concentrate their portfolio on local stocks if they are better able to evaluate their future prospects under certain market conditions. We thus test whether an increase in local bias is associated with an increase in the fund's ability to predict the return of local stocks. A positive association here would indicate that changes in local bias are driven by changes in the fund managers' informational advantage for local stocks.

If, on the contrary, we do not find that changes in local bias are associated with an improvement in the ability to predict the return of local stocks, this would support the view that changes in familiarity biases, such as those formalized in models of ambiguity aversion, can better explain our findings.

4. The Performance of Mutual Funds, Local Holdings, and Market Conditions

4.1 Methodology to Assess Mutual Fund Performance

Next, we examine the relationship between geographical distance and investment performance among mutual fund managers over time. We compare the returns of the funds' local investments to their distant holdings and to local companies not held by local funds under different market conditions, in order to assess whether the informational advantage, revealed by the funds' ability to predict the returns of local stocks in comparison to distant stocks, changes systematically with market conditions.

Because local stocks held by mutual funds may be riskier than distant stocks, for instance because mutual funds invest more in small local firms, it is important to control for risk when comparing the returns of the portfolios of local and distant stocks.

We adjust the return of each individual stock for risk using the risk adjustment method proposed by Daniel, Grinblatt, Titman and Wermers (1997), who subtract from each stock return the return of a well-diversified portfolio of similar size, book-to-market equity (B/M), and momentum attributes. The benchmark portfolio assignments are performed using industry-adjusted B/M ratios following Wermers (2003). The benchmark portfolios are based on all NYSE/AMEX/Nasdaq stocks. We use the stock assignments and benchmark portfolio returns available from Russ Wermers' website to adjust each stock return for risk.[4]

The procedure first sorts all stocks into size quintiles, then within each size quintile sorts stocks into B/M quintiles, and finally within B/M quintiles sorts stocks into momentum (past 12-month return) quintiles. The benchmark portfolios are formed by value-weighting the stocks within each of these 125 groups. Stock j is then matched with one of the 125 portfolios on the basis of its size, B/M ratio, and past-year return from the previous month, and the return of the matched portfolio is subtracted from stock j's return at time t. This risk adjustment has been shown to also account for the sensitivity of individual stock returns to the return of the market (Daniel, Grinblatt, Titman and Wermers, 1997).

After having computed risk-adjusted stock returns as described above, we compute for each fund the monthly risk-adjusted returns of the local and distant portions of its portfolio as in Coval and Moskowitz (2001). For fund manager i at time t, the returns of the local and distant portfolios are calculated as:

---

[4] The Daniel et al. (1997) benchmarks are available via: http://www.smith.umd.edu/faculty/rwermers/ftpsite/Dgtw/coverpage.htm.

$$\tilde{R}_{i,t}^{L} = \frac{1}{3}\sum_{z=1}^{3}\sum_{j=1}^{L_{i,t}} w_{ij,t}^{L}\tilde{r}_{j,t+z},$$

$$\tilde{R}_{i,t}^{D} = \frac{1}{3}\sum_{z=1}^{3}\sum_{j=1}^{D_{i,t}} w_{ij,t}^{D}\tilde{r}_{j,t+z}, \quad (3)$$

where $\tilde{R}_{i,t}^{L}$ and $\tilde{R}_{i,t}^{D}$ are the average monthly risk-adjusted returns over the quarter on fund *i*'s local and distant holdings, respectively; $L_{i,t}$ and $D_{i,t}$ are the number of local and distant firms held by fund i at time *t*; $w_{ij,t}^{L}$ and $w_{ij,t}^{D}$ are the portfolio weights applied to fund *i*'s local and distant holdings; and $\tilde{r}_{j,t}$ is the risk-adjusted return on stock *j* at time *t*.

4.2 Performance of Domestic and Local Stock Portfolios

We create separate portfolios for distant stocks and local stocks using alternative definitions of distance—investments in firms located in the same state as the investment manager, or investments in firms that are less than 100 km away from the investment manager—and compare the performance of stocks held with stocks not held by each mutual fund, as well as the performance of distant stocks sold (or bought) with those of local stocks that each mutual fund holds (or does not hold).

We start by comparing the performance of local and distant portfolios for each of the funds in our sample during the whole sample period and, more importantly for our purposes, during periods of high and low stock market volatility, as measured by the VIX index, and during periods of high and low market sentiment. We define high (low) stock market volatility as quarters during which the VIX index exceeded its 90th percentile of 30 (was below its 10th percentile). Similarly, we define periods of high and low market sentiment.

The results are reported in Table 6. Consistent with Coval and Moskowitz (2001), we find that local fund holdings outperform distant holdings when market conditions are normal (i.e., when stock market volatility is not high). We start by defining local stocks as stocks of firms with headquarters within 100km from the investment manager. We find that the local holdings outperform distant holdings by 0.15% per annum, consistent with stock-picking abilities among local stocks based on informational advantage. We also find that during normal market conditions local holdings outperform local stocks in which fund managers chose not to invest, lending additional support to the view that local fund managers have an informational advantage in local stocks.

However, when market conditions deteriorate and stock market volatility is high, these relationships break down. The superior performance of local holdings disappears, and local stocks in fact underperform distant stocks. In particular, while investment managers appear to have good reasons to sell distant stocks during normal times, because the distant stocks sold underperform the local stocks in their portfolios, there is no evidence that the sales of distant stocks are followed by worse performance than local stocks during periods of heightened market uncertainty.

It is thus surprising that precisely during these periods, when their informational advantage for local stocks deteriorates, investment managers are inclined to sell their holdings of distant stocks and increase their portfolio shares in local stocks, as our earlier findings indicate. This suggests that explanations based on informational advantage cannot explain the changes in local bias. These findings are more consistent with ambiguity averse investors preferring local stocks at times of heightened uncertainty, even if this means they forego performance.

Our results indicate that the informational advantage of investment managers in predicting the returns of local stocks deteriorates, and even vanishes, during periods of strong market sentiment. This would suggest that it is rational during these periods to increase the portfolio holdings of distant stocks, as our earlier findings suggest. This is particularly true given that during periods of high market sentiment the distant stocks purchased by the investment managers outperform the local stocks they do not hold. Thus, the decrease in local bias during periods of strong market sentiment may indeed be driven by a reduction in local investment opportunities of the fund managers.

Results are qualitatively similar when instead of defining local stocks as those located within 100 kilometers from the fund manager, we define local stocks as those that are located in the same U.S. state as the fund manager (Panel B). However, the informational advantage appears somewhat weaker that in our earlier results, indicating that funds' informational advantage does not necessarily extend to the whole state.

Next, we analyze the performance of local and distant portfolios of mutual funds in more detail using regression analysis, which allows us to control for systematic differences in performance across funds due to stock picking ability of fund managers and the possibility that some fund managers may be better at selecting both local and distant stocks by including funds fixed effects. Furthermore, we cluster errors at the fund level to account for the possibility that performance may be correlated over time for the same fund. Finally, we control for systematic differences in performance across all funds over time by including time fixed effects.

First, we compare the performance of distant versus local stocks held. In column 1 of Table 7, we find that, consistent with the findings of Coval and Moskowitz (2001) and Bae, Lim and Kang (2002), fund managers experience higher returns in the portfolio of stocks with headquarters in the same state. However, this effect becomes weaker and eventually disappears as stock market volatility (as measured by the VIX index) increases. Specifically, when the VIX approaches 32, or just above its 90th percentile, the effect disappears, and at values of VIX above its 90th percentile local stocks in fact underperform distant stocks. Given the inferior risk-adjusted returns of local stocks when market conditions deteriorate, the higher return of local stocks when market conditions are strong can hardly provide a rationale for increasing the bias toward local stocks in periods of high uncertainty. In fact, a one standard deviation increase in the VIX of 9 would imply a decrease in the annualized monthly returns that fund managers earn on the stocks of firms headquartered in the same state relative to stocks with out-of-state headquarters of -0.09%.

The results are qualitatively similar in columns 2 to 4, where we use the index of market sentiments as an alternative measure of market conditions and where we use an alternative and more restrictive definition of local stocks, respectively. In particular, when using market sentiment as a proxy for market conditions, we find that funds' ability to predict the returns of local stocks relative to the returns of distant stocks in their portfolio increases monotonically with market sentiment.

Overall, these estimates consistently indicate that the changes in the fund managers' portfolios that we observe when market conditions change are unlikely to be driven by an informational advantage in assessing the future performance of local stocks.

It could be, however, that fund managers sell distant stocks that are expected to experience worse performance during bad times. In this case, the informational advantage would not be reflected in the performance of the (distant) stocks actually held. Columns 4 and 5 compare the performance of the portfolio of local stocks held with the performance of the portfolios of distant stocks sold by the fund. Theories based on asymmetric information would imply that the latter should systematically underperform local stocks in fund portfolios during periods of heightened market uncertainty and for this reason fund managers should rationally concentrate their portfolio on local stocks during such periods.

We find no evidence that distant stocks sold during periods of high market uncertainty perform systematically worse. More generally, we find no evidence that sales of distant stocks are driven by information, regardless of the market conditions. This result is robust to whether we define local stocks as stocks of firms with headquarters in the same state of the fund (column 4), or as stocks of firms whose headquarters is less than 100km away from the fund (column 5).

To further scrutinize whether our findings on the change in local bias could be driven by information, we consider that when market conditions improve, fund managers could buy the stocks of less proximate firms because they have exhausted what they deem to be good investments in local stocks and for diversification motives do not want to further increase their holdings in the local stocks they already hold. Without controlling for these alternative explanations, a comparison of the performance of distant stocks with that of local stocks held may result in a bias against theories implying that changes in the investment in local stocks are driven by informational considerations. Therefore, we compare the performance of the portfolio of distant stocks that are newly purchased with a portfolio of local stocks not held by the fund. Specifically, we consider how the performance of these two portfolios varies with market sentiment precisely because we observe that fund managers invest to a larger extent in distant stocks during periods of strong market sentiment. If we find that the performance of distant stocks purchased outperforms that of local stocks not held during periods of strong market sentiment, this would be in support of information based explanations of local bias.

In column 6 and 7, we find no evidence that the purchase of distant stocks is information driven. Whether we define local stocks on the basis of the state of incorporation or on the basis of a distance of less than 100km between the fund manager and the firm's headquarters, we find that the performance of the portfolio of distant stocks purchased does not differ from the performance of the portfolio of local stocks that the fund does not hold. This is also the case during periods of strong market sentiment, which is when fund managers tend to purchase stocks of more distant firms to a larger extent. Thus, our findings are unlikely to depend on the possibility that fund managers invest in the stocks of distant firms after having exhausted local investment opportunities.

Overall, we do not find that fund managers earn superior returns on local stocks during periods of heightened market uncertainty. Similarly, it does not appear that the reduction in local bias during periods of high sentiment is due to an exhaustion of the funds' local investment opportunities. Therefore, we conclude that informational advantages are unlikely to be an important factor in explaining the sensitivity of local bias to market conditions. Instead, our evidence is more consistent with a behavioral explanation whereby changes in market conditions affect the preference of ambiguity-averse investors for local stocks.

5. Conclusions

While there is a large literature on the significance of home (local) bias in investor portfolios, variation in home bias across investors and time has received little attention to date. This is remarkable given that we find that the local bias of investors varies strongly over time. In particular, we show that mutual funds invest a disproportionately larger fraction of their portfolio in local stocks when market conditions are poor and reduce this bias in their holdings toward local stocks when market conditions improve.

The lack of focus on the time-variation in the local bias of investor equity holdings is unfortunate given that an analysis of this time variation can shed light on the long-standing home bias puzzle in ways that studies relying only on cross-sectional variation in home bias cannot do. In particular, by studying time variation in local bias, we can control for fund fixed effects in our analysis, therefore effectively controlling for any fund attributes that may influence a fund's preference for local stocks. Moreover, by studying changes in local bias, we can effectively test alternative theories of home (or local) bias by exploiting the sensitivity of these theories to changes in market conditions over time. In particular, a common explanation for the presence of local bias relies on the role of asymmetric information, and specifically, the superior ability of mutual funds to select local stocks due to reduced monitoring and search costs. To the extent that such informational advantages are particularly important when market conditions are poor, one would expect that the performance in the local positions of active managers is significantly stronger at times when market conditions are weak. Instead, we find that fund managers do not earn superior returns on local stocks during periods of heightened market uncertainty. This finding suggests that at least part of the bias toward local stocks does not arise from informational advantages and is consistent with a behavioral explanation whereby changes in market conditions affect the preference of ambiguity averse investors for local stocks.

Taken together, our results show that home bias changes substantially over time and suggest that exploiting such changes in the behavior of investors is a fruitful avenue for gaining new insights into the origins of the home bias in investment.

References

Adrian, Tobias and Hyun Song Shin, 2010. Liquidity and leverage. *Journal of Financial Intermediation,* forthcoming.

Ahearne, Allan, William Griever, and Francis Warnock, 2004. Information costs and home bias: an analysis of US holdings of foreign equities. *Journal of International Economics* 62, 313–336.

Bae, Kee-Hong, Jun-Koo Kang, and Chan-Woo Lim, 2002. The value of durable bank relationships: evidence from Korean banking shocks. *Journal of Financial Economics* 64, 181–214.

Baker, Malcolm, and Jeffrey Wurgler, 2006. Investor sentiment and the cross-section of stock returns. *Journal of Finance* 61, 1645–1680.

Baker, Malcolm, and Jeffrey Wurgler, 2007. Investor sentiment in the stock market. *Journal of Economic Perspectives* 21, 129–152.

Barberis, N., forthcoming. Psychology and the financial crisis of 2007–2008. In: Haliassos, M. (Ed.), Financial Innovation and the Crisis. MIT Press, Massachusetts.

Bekaert, Geert and Guojun Wu, 2000. Asymmetric volatility and risk in equity markets. *Review of Financial Studies* 13, 1–42.

Bernile, Gennaro, Alok Kumar and Johan Sulaeman, 2011. Leveling the Playing Field: Regulation and Disappearing Local Bias, Working Paper, University of Miami and Southern Methodist University.

Bohn, Henning, and Linda Tesar, 1996. U.S. equity investment in foreign markets: portfolio rebalancing or return chasing? *American Economic Review* 86, 77–81.

Boyle, Phelim P., Lorenzo Garlappi, Raman Uppal, and Tan Wang, 2012. Keynes meets Markowitz: The trade-off between familiarity and diversification. *Management Science* 58, 253–272.

Brennan, Michael, and Henry Cao, 1997. International portfolio investment flows. *Journal of Finance* 52, 1851–1880.

Cetorelli, Nicola, and Linda Goldberg, 2011. Banking globalization and monetary transmission. *Journal of Finance*, forthcoming.

Chen, Joseph, Harrison Hong, Ming Huang, and Jeffrey D. Kubik, 2004. Does fund size erode mutual fund performance? The role of liquidity and organization. *American Economic Review* 24, 1276–1302.

Chan, Kalok, Vicentiu Covrig, Lilian Ng, 2005. What determines the domestic bias and foreign bias? Evidence from mutual fund equity allocations worldwide. *Journal of Finance* 60, 1495–1534.

Coval, Joshua, and Tobias Moskowitz, 1999. Home bias at home: Local equity preference in domestic portfolios. *Journal of Finance* 54, 2045–2073.

Coval, Joshua, and Tobias Moskowitz, 2001. The geography of investment: Informed trading and asset prices. *Journal of Political Economy* 109, 811–841.

Cremers, M. K. J. and A. Petajisto, 2009, How Active is Your Fund Manager? A New Measure that Predicts Performance, *Review of Financial Studies* 22, 3329-3365.

Curcuru, Stephanie, Charles Thomas, Francis Warnock, and Jon Wongswan, 2011. U.S. international equity investment and past and prospective returns. *American Economic Review* 101, 3440–3455.

Daniel, Kent, Mark Grinblatt, Sheridan Titman, and Russell Wermers, 1997. Measuring mutual fund performance with characteristic-based benchmarks. *Journal of Finance* 52, 1035–1058.

Epstein, Larry, 2001. Sharing ambiguity. *American Economic Review* 91, 45–50.

Forbes, Kristin, and Francis Warnock, 2011. Capital flow waves: Surges, stops, flight, and retrenchment. NBER Working Paper No. 17351, August 2011.

French, Kenneth, and James Poterba, 1991. Investor diversification and international equity markets. *American Economic Review* 81, 222–226.

Garlappi, Lorenzo, Raman Uppal, Tan Wang, 2007. Portfolio selection with parameter and model uncertainty: A multi-prior approach. *Review of Financial Studies* 20, 41–81.

Giannetti, Mariassunta and Luc Laeven, 2012a. The flight home effect: Evidence from the syndicated loan market during financial crises. *Journal of Financial Economics* 104, 23–43.

Giannetti, Mariassunta and Luc Laeven 2012b. Flight Home, Flight Abroad and International Credit Cycles. *American Economic Review P&P*, forthcoming.

Grinblatt, Mark, and Matti Keloharju, 2000. The investment behavior and performance of various investor types: a study of Finland's unique data set. *Journal of Financial Economics* 55, 43–67.

Grinblatt, Mark, and Matti Keloharju, 2001. How distance, language, and culture influence stockholdings and trades. *Journal of Finance* 56, 1053–1073.

Heath, Chip, Tversky, Amos, 1991. Preference and belief: ambiguity and competence in choice under uncertainty. *Journal of Risk and Uncertainty* 4, 5–28.

Huberman, Gur, 2001. Familiarity breeds investment. *Review of Financial Studies* 14, 659–680.

Kang, Jun-Koo, and René Stulz, 1997. Why is there a home bias? An analysis of foreign portfolio ownership in Japan. *Journal of Financial Economics* 46, 3–28.

Kacperczyk, Marcin, Clemens Sialm, and Lu Zheng, 2005. On the industry concentration of actively managed equity mutual funds. *Journal of Finance*, 60, 1983–2011.

Kim, Woochan, and Shang-Jin Wei, 2002. Foreign portfolio investors before and during a crisis. *Journal of International Economics* 56, 77–96.

Lewis, Karen, 1999. Trying to explain home bias in equities and consumption. *Journal of Economic Literature* 37, 571–608.

Portes, Richard, and Hélène Rey, 2005. The determinants of cross border equity flows. *Journal of International Economics* 65, 269–296.

Seasholes, Mark, and Ning Zhu, 2010. Individual investors and local bias. *Journal of Finance* 65, 1987–2010.

Van Nieuwerburgh, Stijn, and Laura Veldkamp, 2009. Information immobility and the home bias puzzle. *Journal of Finance* 64, 1187–1215.

Wermers, Russ, 2003. Is money really 'smart'? New evidence on the relation between mutual fund flows, manager behavior, and performance persistence. Unpublished manuscript, University of Maryland.

Table 1
Descriptive Statistics

This table presents summary statistics of our main regression variables, grouped by fund characteristics, firm characteristics, and other variables. Share is the percentage of the portfolio that fund manager *j* has invested in stock *i* at the end of quarter t; the shares invested by fund manager j during quarter t add up to 100. Sell is a dummy variable that takes a value of 1 if stock holdings of fund *j* in stock *i* have decreased during quarter t, and zero otherwise. Buy is a dummy variable that takes a value of 1 if stock holdings of fund j in stock *i* have increased during quarter t, and zero otherwise. Distance is the distance between the fund managers and the firm's headquarters in 100km. Fund return is the annualized monthly return of the portfolio of stocks of fund j during quarter t. Flow is the amount of net flows experienced by fund j during the previous quarter t-1. TNA is the total net assets (in 1,000 US$) of fund j at the end of quarter t. Number of positions is the number of stock holdings of fund j at the end of quarter t. Weight is the dollar weight of firm i in the aggregate portfolio of mutual funds at the end of quarter t. Weight by style is the dollar weight of firm i at the end of quarter t in the aggregate portfolio of funds that share the same style as fund j. M/B ratio is the market-to-book ratio of firm i at the end of the year. ROA is the return on assets of firm i at the end of the year. Liquidity is the trading volume of stock *i* at the end of the year. Ln(firm cap) is the natural logarithm of the market capitalization of firm *i* at the end of the year. Ret is the stock return of firm *i* over the quarter t. Betav is the market beta of firm *i* at the end of quarter t. Leverage is the ratio of debt to total assets of firm *i* at the end of the year. Same state is a dummy variable that takes a value of one if fund manager j is located in the same state as the headquarters of firm *i*, and zero otherwise. Less 100km is a dummy variable that takes a value of one if the distance between fund manager j and the headquarters of firm *i* is less than 100 kilometers, and zero otherwise. VIX is the average of the VXO index in quarter t, divided by 10. Sentiment is the orthogonalized sentiment index in Baker and Wurgler (2006, 2007).

Variable	mean	st dev	p25	p50	p75	N
Fund characteristics						
Share	0.89	1.50	0.05	0.35	1.19	11,500,000
Sell	0.33	0.47	0.00	0.00	1.00	11,500,000
Buy	0.39	0.49	0.00	0.00	1.00	11,500,000
Distance (in 100km)	17.78	13.31	6.36	14.92	27.16	11,500,000
Fund return	0.02	0.10	-0.03	0.02	0.07	11,500,000
Flow	0.03	0.10	-0.03	0.01	0.08	11,300,000
TNA	171,428	659,549	7,986	27,416	91,473	11,500,000
Number of positions	347.55	458.25	80.00	163.00	417.00	11,500,000
Firm Characteristics						
Weight	0.10	0.65	0.00	0.01	0.06	11,500,000
Weight by style	0.16	0.35	0.01	0.05	0.15	7,530,440
M/B ratio	1.50	1.32	0.52	1.07	2.04	7,454,269
ROA	0.13	0.17	0.08	0.13	0.19	10,900,000
Liquidity	0.00	0.00	0.00	0.00	0.00	11,500,000
Ln(firm mcap)	22.01	1.91	20.64	21.90	23.37	7,524,074
Ret	0.01	0.09	-0.03	0.01	0.05	11,500,000
Betav	1.10	0.58	0.71	1.03	1.40	7,646,627
Leverage	0.42	0.19	0.29	0.42	0.54	10,400,000
Other						
Same state	0.07	0.26	0.00	0.00	0.00	11,500,000
Less 100km	0.07	0.26	0.00	0.00	0.00	11,500,000
VIX (divided by 10)	2.21	0.90	1.43	2.18	2.60	11,400,000
Sentiment	0.15	0.60	-0.21	0.04	0.33	11,500,000

Table 2
The Effect of Distance on Portfolio Shares Under Different Market Conditions

The dependent variable is Share, the percentage of the stock holdings of fund *j* invested in stock *i* during quarter *t*. Distance is the distance between the fund manager and the firm's headquarters, expressed in 100km. VIX is the average of the VXO index in quarter t, divided by 10. Sentiment is the orthogonalized version of the sentiment index in Baker and Wurgler (2006, 2007). Weight is the dollar weight of firm i in the aggregate portfolio of mutual funds at the end of quarter t. Weight by style is the dollar weight of firm i at the end of quarter t in the aggregate portfolio of funds that share the same style as fund j. In columns 5 to 7, we control for time effects by including a linear time trend and a quadratic time trend, as well as the total amount of asset under management by mutual funds during the quarter and the square of the total amount of assets under management during the quarter. Errors are clustered at the fund-quarter level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6) Year≥1990 Year<2000	(7) Year≥2000
Distance	0.0006***	-0.0008***	0.0002***	-0.0006***	-0.6455***	1.4536***	-0.6084***
	(0.0001)	(0.0000)	(0.0001)	(0.0000)	(0.0356)	(0.2050)	(0.0352)
Distance × VIX	-0.0006***		-0.0003***		-0.0004***	-0.0003**	-0.0001***
	(0.0000)		(0.0000)		(0.0000)	(0.0002)	(0.0000)
Distance × Sentiment		0.0001**		0.0003***			
		(0.0001)		(0.0000)			
Weight	0.4738***	0.4870***			0.4743***	0.7519***	0.4276***
	(0.0113)	(0.0113)			(0.0113)	(0.0233)	(0.0119)
Weight by style			1.1469***	1.1466***			
			(0.0069)	(0.0069)			
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Trends	No	No	No	No	Yes	Yes	Yes
Observations	11,350,547	11,531,979	7,530,440	7,530,440	11,350,547	2,992,000	8,358,547
R-squared	0.363	0.360	0.442	0.442	0.367	0.339	0.405

Table 3
Controlling for Fund Size and Firm Characteristics

The dependent variable is Share, the percentage of the stock holdings of fund *j* invested in stock *i* during quarter *t*. Distance is the distance between the fund manager and the firm's headquarters, expressed in 100km. VIX is the average of the VXO index in quarter t, divided by 10. Flow is the amount of net flows experienced by fund j during the previous quarter t-1 divided by the total net assets under management at the beginning of the quarter. Fund return is the annualized monthly return of the portfolio of stocks of fund j during quarter t. Ln(TNA) is the natural logarithm of the total net assets under management (in 1,000 US$) of fund j at the end of quarter t-1. Number of positions is the number of stock holdings of fund j at the end of quarter t-1. Weight is the dollar weight of firm *i* in the aggregate portfolio of mutual funds at the end of quarter t. M/B ratio is the market-to-book ratio of firm i at the end of the previous year. ROA is the return on assets of firm i at the end of the previous year. Liquidity is the trading volume of stock *i* at the end of the previous year. Ln(firm cap) is the natural logarithm of the market capitalization of firm *i* at the end of the previous year. Ret is the stock return of firm i over the quarter t-1. Betav is the market beta of firm i at the end of quarter t. Leverage is the ratio of debt to total assets of firm *i* at the end of the previous year. Regressions include fund fixed effects and control for time effects including a linear trend a quadratic trend, the total amount of asset under management by mutual funds during the quarter and the square of the total amount of assets under management during the quarter. Errors are clustered at the fund-quarter level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
Distance	-0.6534***	-0.6487***	-0.6695***	-0.5072***
	(0.0364)	(0.0360)	(0.0390)	(0.0581)
Distance × VIX	-0.0005***	-0.0004***	-0.0002***	0.0001**
	(0.0000)	(0.0000)	(0.0000)	(0.0001)
Distance × Flow	-0.0007*			
	(0.0004)			
Distance × Fund return	-0.0013***			
	(0.0004)			
Ln(TNA)		-0.0562***		-0.0431***
		(0.0018)		(0.0023)
Number positions			-0.0006***	
			(0.0000)	
Weight	0.4717***	0.4747***	0.4727***	0.4029***
	(0.0114)	(0.0113)	(0.0113)	(0.0138)
M/B ratio				-0.0263***
				(0.0012)
ROA				0.1666***
				(0.0204)
Liquidity				-108.8963***
				(6.1053)
Ln(Firm mcap)				0.1904***
				(0.0019)
Ret				0.8028***
				(0.0120)
Betav				0.0236***
				(0.0015)
Leverage				-0.1825***
				(0.0040)
Fund FE	Yes	Yes	Yes	Yes
Time trend	Yes	Yes	Yes	Yes
Observations	9,385,105	9,531,028	9,535,233	4,382,468
R-squared	0.366	0.367	0.370	0.422

Table 4
Differences across Funds and Stocks

The dependent variable is Share, the percentage of the stock holdings of fund *j* invested in stock *i* during quarter *t*. Distance is the distance between the fund manager and the firm's headquarters, expressed in 100km. VIX is the average of the VXO index in quarter t, divided by 10. Concentrated portfolio is a dummy variable that takes value 1 if the number of positions held by the fund is below the first quartile during the previous quarter and takes value zero otherwise. Small cap is a dummy variable that takes value 1 if the fund has been classified as small cap by Morningstar and takes value zero otherwise; only funds for which the Morningstar classification is available are included. High volatility is a dummy variable that takes value equal to 1 if the standard deviation of the stocks daily returns during the previous year is above the 75th percentile and is equal to zero otherwise. Top 20 City is a dummy variable that takes value equal to 1 if the fund managers is located in one of the top 20 US city and is equal to zero otherwise. Errors are clustered at the fund-quarter level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(6)	(5)
Distance	-0.0030***	-0.0035***	-0.0026***	-0.0012***	-0.0017***	-0.0016***
	(0.0002)	(0.0006)	(0.0001)	(0.0002)	(0.0002)	(0.0002)
Distance × VIX	-0.0003***	-0.0012***	-0.0004***	-0.0001**	-0.0005***	-0.0007***
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0001)
Distance × VIX × Concentrated Portfolio			-0.0004***			
			(0.0001)			
Distance × VIX × Small Cap Fund				0.0000		
				(0.0001)		
Distance × VIX × High Volatility Stock					-0.0002***	
					(0.0000)	
Distance × VIX × Top20 City Fund						0.0003***
						(0.0001)
Distance × Concentrated Portfolio			0.0004*			
			(0.0002)			
Distance × Small Cap Fund				-0.0011***		
				(0.0002)		
Distance × High Volatility Stock					-0.0010***	
					(0.0001)	
Distance × Top20 City Fund						-0.0009***
						(0.0002)
Concentrated Portfolio			0.3671***			
			(0.0063)			
Small Cap Fund				0.0350		
				(0.0326)		
High Volatility Stock					0.0829***	
					(0.0015)	
Top 20 City Fund						0.0624**
						(0.0310)
Weight	0.5516***	0.7494***	0.4666***	0.4177***	0.4673***	0.4675***
	(0.0155)	(0.0572)	(0.0122)	(0.0129)	(0.0122)	(0.0122)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Time trend	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,096,385	808,003	9,341,673	6,511,677	9,341,673	9,341,673
R-squared	0.331	0.342	0.377	0.420	0.374	0.374

Table 5
Alternative Measures of Distance and Local Holdings

The dependent variable in columns 1 and 2 is Share, the percentage of the stock holdings of fund *j* invested in stock *i* during quarter *t*. The dependent variable in column 3 is Sell, a dummy variable that takes a value of 1 if stock holdings of fund *j* in stock *i* have decreased during quarter *t*, and zero otherwise. The dependent variable in column 4 is Buy, a dummy variable that takes a value of 1 if stock holdings of fund *j* in stock *i* have increased during quarter *t*, and zero otherwise. Less 100km is a dummy variable that takes a value of one if the distance between fund manager j and the headquarters of firm i is less than 100 kilometers, and zero otherwise. Same state is a dummy variable that takes a value of one if fund manager j is located in the same state as the headquarters of firm i, and zero otherwise. VIX is the average of the VXO index in quarter t, divided by 10. Distance is the distance between the fund managers and the firm's headquarters in 100km. Sentiment is the orthogonalized version of the sentiment index in Baker and Wurgler (2006, 2007). M/B ratio is the market-to-book ratio of firm i at the end of the previous year. ROA is the return on assets of firm i at the end of the previous year. Liquidity is the ratio of liquid to total assets of firm i at the end of the previous year. Ln(firm cap) is the natural logarithm of the market capitalization of firm i at the end of the previous year. Ret is the stock return of firm i over the quarter t. Betav is the market beta of firm i at the end of quarter t-1. Leverage is the ratio of debt to total assets of firm i at the end of the previous year. Ln(TNA) is the natural logarithm of total net assets (in 1,000 US$) of fund j at the end of quarter t-1. Weight is the dollar weight of firm i in the aggregate portfolio of mutual funds at the end of quarter t. Regressions include fund fixed effects and control for time effects including a linear trend a quadratic trend, the total amount of asset under management by mutual funds during the quarter and the square of the total amount of assets under management during the quarter. Errors are clustered at the fund-quarter level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1) Share	(2) Share	(3) Sell	(4) Buy
Less 100km	-0.0058			
	(0.0069)			
Less 100km × VIX	0.0222***			
	(0.0029)			
Same state		0.0008		
		(0.0070)		
Same state × VIX		0.0090***		
		(0.0028)		
Distance			-0.0000	0.0000
			(0.0001)	(0.0000)
Distance × VIX			0.00004*	
			(0.0000)	
Distance × Sentiment				0.0001**
				(0.0000)
M/B ratio	-0.0268***	-0.0263***	0.0006*	0.0021***
	(0.0012)	(0.0012)	(0.0003)	(0.0003)
ROA	0.1684***	0.1666***	0.0032*	-0.0166***
	(0.0206)	(0.0204)	(0.0018)	(0.0046)
Liquidity	-98.5610***	-107.7711***	29.5695***	-7.6492***
	(5.7741)	(6.1217)	(2.0322)	(1.6697)
Ln(Firm mcap)	0.1896***	0.1905***	0.0010**	0.0152***
	(0.0019)	(0.0019)	(0.0005)	(0.0003)
Ret	0.8108***	0.7982***	-0.0508***	0.0176***
	(0.0122)	(0.0122)	(0.0043)	(0.0043)
Betav	0.0217***	0.0231***	0.0072***	0.0092***
	(0.0015)	(0.0015)	(0.0006)	(0.0006)
Leverage	-0.1845***	-0.1821***	0.0104***	-0.0023*
	(0.0040)	(0.0040)	(0.0014)	(0.0014)
Weight	0.4024***	0.4028***		
	(0.0138)	(0.0138)		
Ln(TNA)	-0.0466***	-0.0431***		
	(0.0023)	(0.0023)		
Fund FE	Yes	Yes	Yes	Yes
Time trend	Yes	Yes	Yes	Yes
Fund FE × Time Effect	No	No	Yes	Yes
Observations	4382,468	4,382,468	4,383,768	3,699,371
R-squared	0.422	0.422	0.278	0.276

Table 6
Performance of Local and Distant Fund Holdings

This table reports annualized risk-adjusted returns for local and distant fund holdings, with the local portion defined as stocks located within 100 kilometers of the fund manager's location in Panel A and as located in the same state in Panel B. Every quarter from January 1986 to December 2009, each fund is split into a local portion and a distant portion. The average returns of these portfolios are computed for each fund every month and then averaged across all funds. Returns are risk-adjusted following Daniel et al. (1997). Risk-adjusted returns are winsorized at bottom and top fifth percentile. The table also reports the average difference in risk-adjusted returns between the local and distant portfolios; the risk-adjusted return of local stocks not being held by local funds; the difference between the performance of local and local not held portfolios; and the difference in returns between the portfolio of local stocks held by funds that increased their holdings in the stock over the quarter and the portfolio of local stocks held by funds that decreased their holdings in the stock over the quarter. Statistics are reported separately for periods of high and low stock market volatility, with high stock market volatility defined as quarters during which the average VIX index exceeds its 90th percentile of 30 and for periods with high and low stock market sentiment, with high sentiment defined as quarters during which the market sentiment index exceeds its 90th percentile of 1.28. Annualized returns are expressed in percentages, with t-statistics between parentheses.

Panel A: Local defined based on 100km distance

Portfolio	All periods	Low VIX	High VIX	Low sentiment	High sentiment
Local	0.07	0.16	-0.12	0.09	-0.15
Distant	0.00	0.01	-0.04	0.00	-0.05
Local – Distant	0.07	0.15	-0.08	0.09	-0.10
	(1.60)	(2.96)	(-0.69)	(1.85)	(-0.58)
Local, Not Held	-0.01	0.03	-0.16	0.01	-0.32
Local – Local, Not Held	0.10	0.12	0.10	0.09	0.22
	(2.21)	(2.41)	(0.88)	(1.97)	(1.15)
Local, Buy	0.23	0.30	0.11	0.34	-1.11
Local, Sell	0.11	0.21	-0.09	0.15	-0.37
Local, Buy – Local, Sell	0.19	0.13	0.54	0.25	-0.59
	(1.26)	(0.79)	(1.53)	(1.61)	(-0.94)
Distant, Buy	0.02	0.04	-0.17	0.03	-0.19
Distant, Sell	-0.00	0.04	-0.03	0.01	-0.15
Distant, Sell – Local	-0.11	-0.13	-0.17	-0.12	0.01
	(-2.33)	(-2.52)	(-1.44)	(-2.44)	(0.04)
Distant, Buy – Local, Not Held	0.03	-0.00	0.13	0.03	0.13
	(3.21)	(-0.08)	(5.69)	(2.44)	(3.13)

Panel B: Local defined based on same state

Portfolio	All periods	Low VIX	High VIX	Low sentiment	High sentiment
Local	0.04	0.13	-0.24	0.05	-0.19
Distant	-0.00	0.01	-0.04	0.00	-0.05
Local – Distant	0.03	0.11	-0.20	0.05	-0.15
	(0.83)	(2.45)	(-1.94)	(1.12)	(-0.84)
Local, Not Held	-0.01	0.04	-0.16	0.01	-0.32
Local – Local, Not Held	0.04	0.07	-0.02	0.03	0.17
	(1.03)	(1.46)	(-0.17)	(0.79)	(0.95)
Local, Buy	0.36	0.45	0.11	0.46	-1.04

Portfolio	All periods	Low VIX	High VIX	Low sentiment	High sentiment
Local, Sell	0.01	-0.07	-0.81	-0.19	-1.27
Local, Buy – Local, Sell	0.44	0.31	1.09	0.44	0.50
	(2.77)	(1.73)	(2.96)	(2.66)	(0.75)
Distant, Buy	0.01	0.03	-0.04	0.02	-0.19
Distant, Sell	-0.01	0.04	-0.18	0.00	-0.17
Distant, Sell – Local	-0.05	-0.07	-0.07	-0.06	-0.01
	(-1.24)	(-1.41)	(-0.65)	(-1.28)	(-0.05)
Distant, Buy – Local, Not Held	0.02	-0.01	0.13	0.02	0.12
	(2.15)	(-0.99)	(5.31)	(1.39)	(2.97)

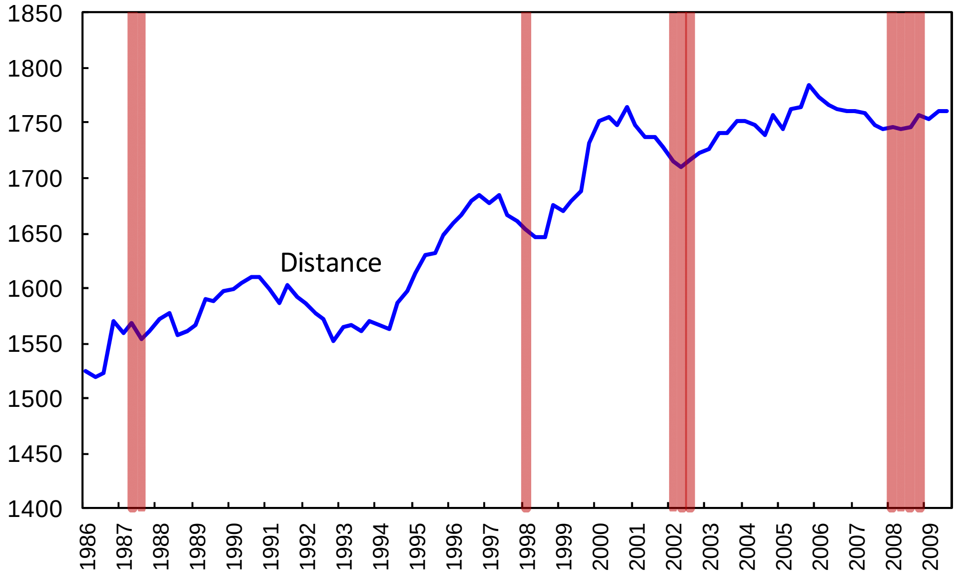
Table 7
Performance of Distant and Local Stocks

The dependent variable is the annualized monthly return of a portfolio of stocks of fund *j* during quarter *t*. For each fund and quarter, the sample includes the return of two portfolios, whose return we compare. Returns are adjusted using the method of Daniel et al. (1997). The relevant portfolios are indicated in each column. Same state is a dummy variable that takes a value of one if fund manager j is located in the same state as the headquarters of firm i, and zero otherwise. Less 100km is a dummy variable that takes a value of one if the distance between fund manager j and the headquarters of firm i is less than 100 kilometers, and zero otherwise. VIX is the average of the VXO index in quarter t, divided by 10. Sell is a dummy variable that takes a value of 1 if stock holdings of fund *j* in stock *i* have decreased during quarter *t*, and zero otherwise. Buy is a dummy variable that takes a value of 1 if stock holdings of fund *j* in stock *i* have increased during quarter *t*, and zero otherwise. All regressions include fund and time fixed effects. Errors are clustered at the fund level. The sample includes 3,423 funds. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1) Distant vs local stocks held	(2) Distant vs local stocks held	(3) Distant vs local stocks held	(4) Distant vs local stocks held	(5) Same state stocks held vs. other state stocks sold	(6) Less 100km stocks held vs. over 100km stocks sold	(7) Same state stocks not held vs other state stocks bought	(8) Less 100km stocks not held vs over 100km stocks bought
Same state	0.3119***	0.0387						
	(0.0691)	(0.0270)						
Same state × VIX	-0.0967***							
	(0.0295)							
Same state × Sentiment		0.2696***						
		(0.0452)						
Less 100km			0.2893***	0.0746***				
			(0.0718)	(0.0285)				
Less 100km × VIX			-0.0749**					
			(0.0307)					
Less 100km × Sentiment				0.1791***				
				(0.0470)				
Sell					-0.1758	-0.1104		
					(0.1255)	(0.1283)		
Sell × VIX					-0.0049	-0.0199		
					(0.0539)	(0.0557)		
Buy							0.0007	0.0062
							(0.0110)	(0.0108)
Buy × Sentiment							0.0250	0.0234
							(0.0169)	(0.0167)
Fund and Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	180,619	187,293	177,985	184,543	162,955	160,740	199,646	199,719
R-squared	0.020	0.019	0.018	0.018	0.042	0.042	0.060	0.060

Figure 1
Average distance and stock market volatility (VIX), 1986-2009, quarterly data

Panel A. Average Distance and High VIX periods



Notes: Vertical shaded bars in red denote quarters during which average VIX index exceeded its 90th percentile (of 30), indicating high stock market volatility.

Panel B. A Closer Look at the Last Decade