Local Ownership, Crises, and Asset Prices: Evidence from US Mutual Funds

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Keywords: Home bias, local bias, mutual funds, stock market, aggregate market volatility

JEL Classifications: F4, G02, G11

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1. Introduction

The integration of global capital markets came abruptly to a halt during the 2007-2008 financial crisis, as had happened before in the 1930s (Obstfeld and Taylor, 2004). The reversals of capital flows that ensued have been linked to country risk factors and financial protectionism in a number of recent studies using international data (Milesi-Ferretti and Tille, 2011; Lane and Milesi-Ferretti, 2012; Forbes and Warnock, 2012; Giannetti and Laeven, 2012; and Rose and Wieladek, 2012). Yet, it remains unexplored whether the collapse in international capital flows reflects an increase in international barriers and financial protectionism, wealth effects that lead investors to allocate a smaller fraction of their portfolio to foreign assets, or rather a portfolio reallocation toward domestic assets, revealing stronger preference for geographically close investments during uncertain times. Also, questions arise about the extent to which these changes in market segmentation have an effect on local asset prices and increase the exposure of local assets to systematic risk factors.

This paper explores whether investors' preference for geographically close investments becomes stronger when market conditions deteriorate and, if so, whether this has consequences for asset prices. To abstract from the role of national boundaries, we study how local ownership by mutual funds vary with market conditions within a single country, the United States. Investors' preference for local stocks is known to prevail across countries as well as within countries (Coval and Moskowitz, 1999). Thus, by considering the local ownership of US mutual funds for a broad sample of US stocks, not only do we have access to more detailed data on mutual funds than it would be possible in an international setting, but we are also able to abstract from any effects that institutional differences and other international barriers to investment may have on the rebalancing of portfolios away from distant stocks. Since any friction driving the preference for local stocks is likely to increase with cultural and physical distance, our approach allows us to obtain a conservative estimate of the increased preference for familiar investments in periods of high aggregate market volatility.

Our results show that during periods of high aggregate market volatility, which – following the literature – we capture using increases in the CBOE Volatility Index (VIX) measuring innovations in market-wide implied volatility, mutual fund managers sell proportionally fewer stocks of firms whose headquarters are located in the same state as they are than comparable out-of-state stocks. Put differently, during periods of market stress, investors rebalance their portfolios towards close firms, independently of other firm characteristics, revealing an increase in the preference for local stocks. We show that these results do not depend on changes in firm characteristics or on the geographical distribution of funds and firms. Furthermore, our results are robust to controlling for fund characteristics, including funds' past performance, net flows, and asset size.

Importantly, the change in preference for local stocks of mutual funds has sizeable effects on stock prices and returns. When large negative shocks increase aggregate market volatility, firms with a larger proportion of local mutual funds as shareholders have higher market valuations than firms whose stocks are owned by distant mutual funds. This result is robust to using orthogonal sources of variation in mutual funds' ownership. First, the result does not appear to be driven by state shocks, because within a state only stocks with higher ex ante local mutual fund ownership have higher valuations during periods of high aggregate market volatility. Second, the result remains robust if we exploit only information on the geographical distribution of mutual funds' and firms' assets as instruments for local ownership, thus abstracting from the possibility that local ownership may be driven by firm characteristics within a state. Furthermore, consistently with the finding that mutual funds create less selling pressure in local stocks during periods of high aggregate market volatility, we find that the returns of stocks with higher local ownership are less exposed to innovations in market-wide implied volatility (as measured by changes in the VIX).

Our results can be interpreted in light of behavioral studies showing that when the probability of making losses is high, such as during periods of high aggregate market volatility, agents prefer to take risks about which they feel more knowledgeable (Heath and Tversky, 1991). A similar argument can be made based on portfolio allocation models that incorporate ambiguity aversion. Epstein (2001) and Epstein and Schneider (2008) show that investors value less ambiguous information, such as information on local stocks, more when fundamentals are more volatile. Furthermore, Garlappi, Uppal, and Wang (2007) and Boyle et al. (2012) show that more uncertainty about stock returns affecting both local and distant stocks may generate an increase in the local bias for ambiguity-averse investors.

The observed increase in portfolio concentration toward local stocks during periods of high aggregate market volatility tends to improve fund managers' performance and is therefore consistent with rational behavior. However, we find limited evidence that the mutual funds' portfolio rebalancing during periods of high aggregate market volatility is driven by an increase in the value of local information. In this case, the outperformance of local stocks held by mutual funds should be stronger in areas with relatively low local demand, where mutual funds face less competition in exploiting their private information. We find instead that local stocks held by mutual funds perform better during periods of high aggregate market volatility only if the firms are headquartered in areas with strong local demand, as proxied by a high concentration of mutual fund assets.

Our work contributes to several strands of the literature. First, we add to a growing number of papers exploring how investors choose which assets to liquidate during financial crises. Existing studies have shown that investors liquidate predominantly liquid assets during periods of market stress. Furthermore, investors experiencing redemptions (Ben-David, Franzoni and Moussawi, 2012), investors hit by larger negative shocks (Manconi, Massa and Yasuda, 2011) and investors with short horizons (Cella, Ellul and Giannetti, 2013) liquidate assets to a larger extent. We highlight the role of proximity in portfolio rebalancing during periods of high aggregate market volatility.

Second, we contribute to a growing strand of literature in international finance that uses data on mutual fund and institutional investor positions to gain a better understanding of the drivers of capital flows (see Gelos, 2011, for a survey). For example, Gelos and Wei (2005) show that funds systematically invest less in less transparent countries; and Jotikasthira, Lundblad and Ramadorai (2012) highlight the importance of common ownership spillovers across international markets where flows to one fund translate into flows to all markets that the fund holds. We highlight differences in trading between local and distant investors during financial crises and link this phenomenon to the observed retrenchment of capital flows.

Our work is also related to a vast literature on home and local biases in the allocation of capital (French and Poterba, 1991; Lewis, 1999; Coeurdacier and Rey, 2013). The presence of home bias has been documented across countries with diverse institutional environments (Kang and Stulz, 1997; Chan, Covrig, and Ng, 2005; Hau and Rey, 2008) and within countries where it has been shown that investors exhibit a preference for geographically close assets (Coval and Moskowitz, 1999, 2001; Grinblatt and Keloharju, 2001). To the best of our knowledge, we are the first to provide evidence that the local ownership of mutual funds exhibits time-variation depending on stock market conditions, and to show that this affects asset prices.[1] Moreover, we do so by analyzing domestic portfolios of US mutual funds, in the absence of other frictions that characterize international data.

Finally, our work is closely related to papers studying how local ownership affects stock prices and returns. For instance, Hong, Kubik, and Stein (2008) show that stock valuation is higher in US states with higher local demand, and Garcia and Norli (2012) show that firms that do

[1] Several other papers have explored how the behavior of investors changes over time, but none of these studies considers the importance of stock market conditions for the preference for local stocks. For instance, Bohn and Tesar (1996) and Kim and Wei (2002) show that US investors chase returns when they allocate their international equity portfolio, while Hau and Rey (2008) and Curcuru, Thomas, Warnock, and Wongsan (2011) question these findings.

business locally have higher stock returns. We contribute to this literature by providing evidence of a positive relation between local ownership and stock market valuations in periods of high aggregate market volatility arising from a time-varying preference for local stocks.

The paper proceeds as follows. Section 2 describes the theoretical background of the analysis. Section 3 presents the data. Section 4 analyzes how the portfolio choice between local and distant stocks varies with market conditions. Section 5 examines the effect of local ownership on firm valuations and returns. Section 6 considers differences in mutual funds' performance arising from investments in in-state versus out-of-state stocks. Section 7 concludes.

2. Theoretical Background

2.1 Individual Fund Managers' Preference for Local Stocks

Existing literature offers two alternative explanations for the existence of a preference for local stocks. Some argue that investors prefer to buy local stocks to exploit their local informational advantages (Brennan and Cao, 1997; Ahearne, Griever, and Warnock, 2004; Portes and Rey, 2005; Van Nieuwerburgh and Veldkamp, 2009). Consistent with this information-based view of the preference for local stocks, several studies find that stocks held by local investors outperform comparable portfolios of distant stocks (Coval and Moskowitz, 1999, 2001; Hau, 2001; Ivkovic and Weisbenner, 2005; Gaspar and Massa, 2007; and Baik, Kang and Kim, 2010). In contrast, other studies do not find that local stocks held outperform other stocks (Grinblatt and Keloharju, 2000, 2001; Huberman, 2001; Seasholes and Zhu, 2010; Pool, Stoffman, and Yonker, 2012). These studies conclude that investors prefer local stocks because they are more familiar with local companies, even if they have no real information about these companies.

While the above explanations are not mutually exclusive, our objective is to evaluate their relative relevance in explaining stronger preference for local stocks when aggregate market volatility increases, such as during financial crises.

An increase in aggregate market volatility is expected to have opposite effects on the changes of the holdings of local and distant stocks of an investor depending on whether the investor's preference for local stocks arises for informational reasons or familiarity biases. This point is easily illustrated. The variance of the returns of stock *i* can be modeled to have an idiosyncratic (σ_u) and a systematic component (σ_S). A fund manager, *j*, with a (positive) informational advantage on stock *i* will expects a return, μ^j_i, which is larger than the return expected by other market participants, $\overline{\mu}_i$. A risk adverse fund manager *j* with mean-variance utility function will overweigh stock *i* in his portfolio if he expects a return μ^j_i, which is larger than the return expected by other market participants, $\overline{\mu}_i$. An increase in the systematic component of risk will lead such a fund manager to decrease the holdings of stock *i* to a larger extent than other market participants. The fund manager will also be expected to decrease his holdings of stock *i* to a larger extent than his holdings of other stocks with similar volatility but with respect to which the fund manager has less optimistic return expectations.

These effects could be reinforced by agency problems in the asset management industry. Picking local stocks is a type of active management strategy, which leads to deviations from the benchmarks against which fund managers are evaluated. Managers that deviate more from their benchmark have a higher probability of underperformance, especially when aggregate market volatility increases. This may lead asset managers to decrease their holdings of local stocks during periods of market turmoil, consistent with the finding that fund managers do less stock picking during recessions (Kacperczyk, Van Nieuwerburgh, and Veldkamp, 2014), which also coincide with periods of high aggregate market volatility (Bloom, 2014).

In contrast, if as in Boyle, Garlappi, Uppal and Wang (2011), the preference for local stocks arises from a familiarity bias, which can be modeled using ambiguity aversion, an increase in the systematic component of risk leads the fund manager to increase the holdings of familiar stocks relative to other asset holdings. This result is obtained holding constant the fund manager's level of ambiguity (and ambiguity aversion) about assets. Higher ambiguity about an asset is modeled as an increase in the width of the confidence interval that an agent has for the expected excess return of that asset. Thus, a fund manager is more familiar with an asset if he has a narrower confidence interval about the estimate of the expected returns of the asset.

The intuition for this result is as follows. An increase in the systematic component of risk implies that asset returns become more correlated and progressively less useful for diversification. When unfamiliar assets tend to behave more like familiar assets, an ambiguity-averse investor will invest less in unfamiliar assets because he is less able to estimate precisely their returns. This generates a *flight to familiarity*.

Thus, only theories relying on ambiguity aversion, or, more generally, a familiarity bias, predict an increase in the holdings of local stocks when aggregate market volatility increases. In what follows, we explore to what extent these alternative theories can explain the changes in asset holdings of US mutual funds managers in US stocks when aggregate market volatility varies.

2.2. Aggregate Effects of Time Varying Preferences for Local Stocks

If the preference for local assets indeed changes when there are large increases in aggregate market volatility, as predicted by ambiguity aversion theories, ex ante cross-sectional differences in local ownership across stocks are associated with demand shocks of different magnitudes. Stocks with fewer local investors will have many (distant) shareholders that sell in the attempt to rebalance their portfolios towards more familiar assets.

The selling pressure generated by distant investors might have to cause large price drops for other shareholders to be willing to purchase the stock and to reestablish equilibrium in the market. Periods of high aggregate market volatility coincide with financial crises (Whaley, 2000). During these periods, it is typically harder to find potential buyers (Duffie 2010), because other investors may experience financial constraints, because of slow moving capital, or because the stocks sold do not have the characteristics preferred by potential buyers (Mitchell, Pulvino, and Stafford 2004). Thus, during such episodes, there may be both demand and supply forces depressing asset prices and the time-varying preference for local stocks may have dramatic consequences.

Crucially, the impact of the forces described above is expected to differ across stocks with ex ante different proportions of local investors. We expect the valuations of stocks with ex ante more local investors to be higher than the valuations of stocks with few local investors in periods in which aggregate market volatility surges.

This way of reasoning has also implications for stock returns. If the demand for stocks of firms with high local mutual fund ownership drops less following increases in aggregate market volatility, we should expect that their stock prices and consequently returns drop to a lower extent when these shocks occur. Also, if the prices of stocks with low local mutual fund ownership drop when aggregate market volatility surges because these stocks experience higher selling pressure, and not for informational reasons, we should observe that their valuations, and therefore their returns, increase to a larger extent when aggregate market volatility drops and investors' preference for proximity decreases. We thus expect that the returns of stocks with low mutual funds ownership are lower in comparison to the returns of stocks with high mutual funds' ownership when aggregate market volatility unexpectedly increases and that they turn higher when aggregate market volatility starts to decrease again. Put differently, we expect stocks with higher local ownership to be less exposed to changes in aggregate market volatility.

Importantly, the time-varying preference for local stocks may affect investors' performance. All investors are expected to increase their holdings of local stocks in comparison to distant stocks when aggregate market volatility increases. However, investors in areas with many local investors (or in stocks with high ex ante local ownership) benefit from the aggregate demand effect described above to a larger extent. Thus, we expect investors in areas with high local demand to experience higher returns on their local portfolio than investors in areas with low local demand during periods with high aggregate market volatility.

3. Data Sources and Main Variables

3.1 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 US-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, similarly to Pool, Stoffman and Yonker (2012).

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.

We obtain information on each fund's investment style from Morningstar. We merge these additional data on mutual funds with the CRSP mutual fund database using fund-specific CUSIP codes. Since we want to concentrate on the US holdings of US actively managed equity mutual funds, we remove the holdings of firms headquartered outside the United States. We further use Morningstar style classifications to exclude funds whose main objective is to invest in bonds or international equities, or that are specialized in particular industries, given that industry specialization may lead to geographical concentration for reasons that are different from those we want to study. Finally, we remove index funds by screening mutual funds' names, and by 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 over the sample period 1986-2009. Table 1 provides summary statistics on the main funds' characteristics.

3.2 Proximity Measures and Other Stock Characteristics

We obtain information on the monthly stock returns of US stocks from CRSP and on firm characteristics, such as return on assets, leverage (ratio of debt to total assets), and book value of equity, from COMPUSTAT. We use COMPUSTAT, Compact Disclosure, and hand-collected information from company filings to determine the geographical location of the headquarters of each firm at different points in time. Following Coval and Moskowitz (2001), we consider only stocks and funds located in continental US (that is, we exclude Alaska, Hawaii, and Puerto Rico). Since firms locate their main operating facilities close to the headquarters (Hong, Kubik and Stein, 2008; Pirinsky and Wang, 2006), investors resident in the same state as the firm's headquarters are closer to the core business activities and the center of information exchange between the firm and its suppliers and investors. Therefore, as is common in the literature, we conjecture that investors proximate to the firms' headquarters are more familiar (or have more information) with the firm.[2]

We use several measures to compute a firm's proximity to a mutual fund. First, we compute the great-circle distance, $d_{i,j}$, between the zip code of firm *i* and the zip code of the management company of fund j:

$$d_{i,j,t} = \frac{2\pi r}{360}\arccos(\cos(lat_{i,t})\cos(lat_{j,t})\cos(lon_{i,t} - lon_{j,t}) + \sin(lat_{i,t})\sin(lat_{j,t})), \quad (1)$$

[2]Investors could acquire familiarity or information on a firm even if they are close to the firms' plants. Neglecting this information introduces noise in our measures of proximity that may bias downwards our findings.

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.

While the distance allows us to capture in a continuous way the proximity of a fund's stockholdings and requires no strong assumptions on which stocks are local, for the purpose of our analysis, as will be clear later, we also need to consider different portfolios of stocks and to have an idea of the extent to which an investor's portfolio weights are tilted towards local stocks. Thus, as is common in the literature (see, for instance, Korniotis and Kumar, 2012; Pool, Stoffman and Yonker, 2012), we define a firm to be local for a given fund manager, if it is headquartered in the same state as the fund's management company. This will enable us to test how investors' holdings in local and distant stocks vary with market conditions and the consequences of local ownership for firm valuations and returns.

3.3 Fund Level Measures of Local Bias and Portfolio Rebalancing

To test whether a fund's preference for local stocks varies over time, we construct alternative proxies for funds' local bias and its changes. First, the distance between firm *i*'s headquarters and fund *j*'s management company enables us to compute the average distance of the stocks in fund *j*'s portfolio at the end of quarter *t*:

$$\bar{d}_{j,t} = \sum_{i=1}^{N_{j,t}} w_{i,j,t} d_{i,j,t}, \qquad (2)$$

where w_{ijt} is the portfolio share of fund *j* in firm *i* at the end of 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*; $d_{i,j,t}$ is the great circle distance between firm *i*'s headquarters and fund *j*'s management company, defined in equation (1); and $N_{j,t}$ is the number of stocks in the portfolio of fund *j* at the end of quarter *t*.[3]

[3] We use distance as opposed to the logarithm of distance in our empirical analysis. Distance (when not transformed) is easier to interpret and large distances are de facto eliminated from our dataset because we exclude firms headquartered in Alaska, Hawaii and Puerto Rico.

Since the geography of listed companies may change over time and we want to focus on changes in the geography of funds' holdings, we also define a benchmark distance, $\bar{d}_{j,t}^{benchmark}$, which varies depending on fund j's management company zip code and is defined similarly to $\bar{d}_{j,t}$, but instead we replace the fund's portfolio weights with firm *i*'s share in total market capitalization. Our first measure of local bias is then defined as:

$$bias_{\text{distance}\,j,t} = \bar{d}_{j,t}^{\ benchmark} - \bar{d}_{j,t}. \quad (3)$$

A positive value denotes a positive local bias in the sense that the fund is holding stocks closer than the benchmark would imply. The average fund holds stocks that are 600 kilometers closer on average than the benchmark (Panel A of Table 1).

While the above variable does not require any assumption about which stocks are relatively more proximate to a fund, it cannot be interpreted in terms of portfolio weights. Since we are ultimately interested in how the portfolio holdings of a fund change, we define a second measure of local bias based on the holdings of local stocks. Most of the literature on the local bias identifies holdings in firms headquartered in the same state as the fund manager to be local (e.g., Bernile, Kumar and Sulaeman, 2015; Korniotis and Kumar, 2012; Pool, Stoffman and Yonker, 2012). We follow this literature and define a second measure of local bias as follows:

$$bias_{state\,j,t} = \frac{w_{j,t}^{in\ state} - w_{market,t}^{in\ state}}{w_{market,t}^{in\ state}}. \quad (4)$$

The variable $bias_{state}$ compares the portfolio share of fund j in in-state stocks at the end of quarter t ($w_{j,t}^{in\ state}$) with the weight of in-state stocks in the market capitalization at the end of quarter t ($w_{market,t}^{in\ state}$). By subtracting $w_{market,t}^{in\ state}$ we consider that the geography of listed companies may change over time. We divide by the $w_{market,t}^{in\ state}$ to abstract from variation arising from the fact that the portfolio holdings in states with few listed companies are naturally smaller and have a level of local bias that does not depend on the supply of listed companies in the state. Panel A of Table 1 shows that on average the mutual funds in our sample appear to hold 33% more local stocks than implied by the market.

The above two measures rely on conventional proxies for local bias but have a major drawback for the purpose of our analysis. For us it is crucial to explore to what extent investors actively rebalance their equity holdings in favor of proximate stocks when market conditions deteriorate, independently of the level of local bias. The portfolio weights in the two measures of local bias we computed so far can change even when managers do not change any of their holdings. This is the case if fund managers are better at picking local stocks, because the local stocks will outperform distant stocks. In turbulent times, the funds' other holdings may suffer to a larger extent, thereby affecting the relative weights of local and distant stocks. To abstract from this possible mechanism, we base most of the fund level analysis on a third proxy that compares a fund's percentage changes in the holdings of local and distant stocks in a way that cannot be driven by stock prices. This variable, measuring an active portfolio rebalancing towards local stocks, is defined as follows:

$$\Delta Distant\ vs.Close_{j,t} = \frac{\sum_{i=1}^{D_{j,t}}\left(shares_{i,j,t+1}^{D} - shares_{i,j,t}^{D}\right)p_{i,t}}{\sum_{i=1}^{D_{j,t}} shares_{i,j,t}^{D}p_{1,t}} - \frac{\sum_{i=1}^{L_{j,t}}\left(shares_{i,j,t+1}^{L} - shares_{i,j,t}^{L}\right)p_{i,t}}{\sum_{i=1}^{L_{j,t}} shares_{i,j,t}^{L}p_{1,t}}, \tag{5}$$

where $shares_{i,j,t+1}^{D}$ is the number of shares held by fund j in out-of-state (D) stock i at the end of quarter $t+1$ and $shares_{i,j,t+1}^{L}$ is the number of shares held by fund j in in-state (L) stock i at the end of quarter $t+1$. All positions are evaluated using beginning of quarter prices so that price changes during the quarter cannot affect this variable. Furthermore, the changes in holdings of close (distant) stocks over the quarter are evaluated relative to the beginning-of-quarter holdings of close (distant) stocks. Thus, the variation of this variable cannot be driven by the relative magnitude of the close and distant holdings or asymmetries in the evolution of their valuations.

As shown in Panel A of Table 1, the average mutual fund appears to sell a larger proportion of out-of-state stocks than in-state stocks, possibly driven by large sell-offs during financial crises. In what follows, we will test whether indeed fund managers rebalance towards local stocks when aggregate market volatility increases.

3.4 Measures of Market Conditions

We capture aggregate market volatility using the VIX index, a measure of implied volatility in S&P500 index options. This index is set by investors and captures consensus view about expected future stock market volatility, that is, precisely the systematic component of stock returns that we aim to measure. The VIX index is often referred to as the "fear gauge index" (Whaley, 2000) and is commonly used in the literature to identify periods of market stress and high aggregate market volatility (see, for instance, Adrian and Shin, 2010; Ben-David, Franzoni and Moussawi, 2011; Bekaert, Ehrmann, Fratzscher, and Mehl, 2012; Ben-Rephael, Kandel, and Wohl, 2012; Forbes and Warnock, 2012; Nagel, 2012; Cella, Ellul and Giannetti, 2013).

The VIX index is 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 US 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.

We use an average of the VIX index during the quarter, because asset managers cannot immediately react to changes in market conditions. However, our results are unaltered if we measure market conditions at the end of the quarter. As we show below, our results are equally unchanged if we use alternative proxies for market conditions that we introduce in the empirical analysis.

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

4.1 Fund Level Evidence

We start by relating the two measures of a mutual fund's local bias to the VIX, our main proxy for aggregate market volatility. We include fund fixed effects, thus holding the average local bias constant, and test whether the local bias varies with market conditions and in what direction.[4] Furthermore, since the proxies for market conditions vary across quarters, we cluster errors at the quarter level.

Columns 1 and 2 of Table 2, where we use respectively $bias_{distance}$ and $bias_{state}$ as dependent variables, suggest that mutual fund managers' preference for local stocks increases in periods of high aggregate market volatility, as is consistent with an increase in familiarity biases. This would suggest that mutual funds rebalance their equity holdings in favor of local stocks. The effect is not only statistically, but also economically significant. Both in column 1 and in column 2, an increase in VIX of 20 points, half of the spike the VIX experienced when the October 1987 market crash or 2008 Lehman's default occurred, leads to an increase in local bias of over 10% in comparison to the mean local bias in the sample.

The remainder of Table 2 explores whether the changes in local bias are indeed driven by active portfolio rebalancing decisions. In particular, we test whether mutual funds sell out-of-state stocks to a larger extent than in-state stocks during periods of high aggregate market volatility using $\Delta Distant\ vs. Close_{j,t}$ as dependent variable. An increase in the preference for local stocks would cause this variable to decrease as investors increase (or decrease to a lower extent) the proportion of local stocks in their portfolios. We regress $\Delta Distant\ vs. Close_{j,t}$ on the level of the VIX, rather than its changes, because we expect fund managers to slowly and persistently rebalance during periods of protracted high aggregate market volatility to minimize the price impact of their

[4] The inclusion of fund fixed effects allows us to control for the correlation of observations referring to the same fund. We thus cluster errors at the quarter level. The statistical significance of the estimates we report is similar if, instead of including fund fixed effects, we double-cluster at the quarter and fund level.

trades. In column 3 of Table 2, mutual funds appear to decrease their holdings of out-of-state stocks to a larger extent when the VIX increases.[5]

Alternative measures of aggregate market volatility appear to be consistently associated with a larger drop in the holdings of out-of-state stocks in comparison to in-state stocks. First, the results are qualitatively invariant if we use the index of macroeconomic uncertainty constructed by Baker, Bloom, and Davis (2012). This index averages several components that reflect the frequency of news media references to economic policy uncertainty, the number of federal tax code provisions set to expire in future years, and the extent of forecaster disagreement over future inflation and federal government purchases, and has been shown to be related to large and persistent declines in GDP and stock prices.

Second, mutual funds appear to rebalance their portfolios towards in-state stocks during economic recessions, identified using NBER recession dates. Previous research has shown that economic uncertainty rises sharply in recessions (Bloom 2014). Finally, mutual funds seem to purchase more out-of-state stocks during periods of high market sentiment, defined using Baker and Wurgler (2007) index of market sentiment.

Thus, it appears that an increase in market volatility is related to stronger preference for local stocks. In column 7, whether our results may be driven by expected market returns, we control for aggregate market returns, as proxied by the average monthly return of the S&P500 index during the quarter. The effect of the VIX on $\Delta Distant\ vs. Close_{j,t}$ increases in absolute value indicating that aggregate market volatility is the most likely determinant of the patterns we observe.

All these results include fund fixed effects and suggest that the effect of market conditions on portfolio rebalancing does not depend on fund time-invariant characteristics. The effects are not only statistically but also economically significant. In column 3, an increase in VIX of 20 points

[5] The results we present hereafter appear to be entirely driven by sales of out-of-state stocks. Mutual funds do not appear to vary their holdings of local stocks because of variation in the VIX index. Nevertheless, we focus on the relative changes of the holdings of local and distant stocks to more precisely capture the funds' portfolio rebalancing.

leads investors to decrease their holdings of distant stocks by 1.2 percentage points more than their holdings of local stocks. While at first glance this may appear a small effect, the average fund rebalancing between distant and local stocks is relatively small on average (-7 percentage points, including crisis periods). More importantly, we show below that due to differences in the geographical distribution of mutual funds, in the aggregate, the individual funds' portfolio rebalancing creates large cross-sectional differences in selling pressure and has significant effects on firm valuations.

A potential explanation for our findings is that when their assets expand, mutual funds may exhaust their best trading ideas, which plausibly involve mostly local stocks, and may expand their holdings to less proximate investments. For example, Chen, Hong, Huang and Kubik (2004) show that when the size of the fund increases due to net flows, fund managers' performance deteriorates possibly because they have to expand the set of investments to their second-best ideas, which in our case may involve the stocks of more distant firms.

We find no evidence in favor of this mechanism. Not only do we control for the flows that a fund has experienced during the previous quarter throughout the analysis, but in Panel A of Table 3, we also add controls for flows experienced up to the previous four quarters (column 1) and the fund's previous quarterly performance (column 2). These findings are consistent with evidence showing that fund managers do not expand their portfolios into new positions when the scale of the fund increases (Pollet and Wilson, 2008), which also would suggest that changes in fund scale cannot drive our findings.

Next, we consider whether any changes in funds' characteristics, correlated with market conditions, may affect their preference for local stocks. We find that the relative change in the holdings of out-of-state and in-state stocks is not systematically affected by the fund's portfolio turnover during the quarter or by the fund's active share, which measures the portfolio distance from an index, as constructed and updated by Cremers and Petajisto (2009) (column 3). In column

4, we control for the fund's net assets under management. The effect of the VIX remains unchanged confirming that changes in the fund's size do not drive our findings.

In the remainder of Panel A of Table 3, we consider how the impact of market conditions on funds' portfolio rebalancing differs across funds with different characteristics, which in turn may provide some insights into the underlying mechanisms. Since fund managers exhibit different degrees of local bias, we ask whether fund managers who actively rebalance their portfolios toward local stocks when aggregate market volatility increases always exhibit a stronger local bias. We find no evidence that this is the case (column 5). If funds with large local biases have an informational advantage, our results may be interpreted to indicate that when aggregate market volatility increases, both funds with and without an informational advantage are subject to an increase in familiarity biases. Put differently, the level of local bias does not necessarily have the same determinants as those of the changes in the preference for local stocks we document.

In the same vein, we also explore whether the effect we highlight is more pronounced for small funds, which tend to have smaller resources to collect information and to rely to a larger extent on their managers' ideas (Pool, Stoffman and Yonker, 2012). We find that the portfolio rebalancing following changes in the VIX is more pronounced for these funds (column 6) and is smaller for team-managed funds (column 7). Small funds and funds that are not managed by teams are more likely to rely on their managers' ideas and biases and this may suggest a behavioral interpretation for our findings.

Furthermore, in column 8, it appears that the effect is more pronounced for funds managed by inexperienced managers, which we identify from Morningstar as funds in which the most experienced manager has an experience of less than 5 years. The effect is however not statistically significant at conventional levels.

Finally, Panel B of Table 3 explores to what extent our results may be driven by the geography of the mutual funds' industry. First in column 1, we explore to what extent the effect of the VIX varies with local demand. We define the local demand for stocks in a state as the one-quarter lag of the ratio of in-state mutual funds' total net assets under management to the total book value of the assets of firms in that state. It appears that the extent of portfolio rebalancing away from distant stocks is somewhat weaker in states with high mutual funds' demand for local stocks.

This conclusion appears supported also by the estimates in column 2, where we exclude fund managers located in the states of New York, Massachusetts, or California, which are the areas with a large concentration of mutual fund companies. The sample is halved and if anything in high-VIX periods funds appear to sell out-of-state stocks to an even larger extent. However, the VIX index has an effect on portfolio rebalancing even if we estimate the regression model considering only the funds located in the states of New York, Massachusetts, and California, suggesting that our finding is not a mechanical artifact of the geographical distribution of mutual funds (column 3).

These estimates also suggest that the increased preference for local stocks is unlikely to be due to fund managers' propensity to support the valuation of local firms. After all, even if a few mutual funds were to engage in price support of nearby firms, the effects should be much weaker in locations with many mutual funds.

4.2 Firm-Fund Level Evidence

A concern with this fund level analysis is that different characteristics of local and distant firms may drive the trading of mutual funds' investors. To put to rest any concerns that omitted firm- or fund time-varying characteristics may be driving our findings, we consider how the portfolio share of fund j in stock i at the end of quarter t varies depending on the proximity of the firm's headquarters and the level of aggregate market volatility. In these specifications, we can absorb firm time-varying heterogeneity by including interactions of firm and time fixed effects. We can also absorb fund time-varying heterogeneity, and completely abstract from any source of wealth effects, by including interactions of time and fund fixed effects. We can thus test whether funds that are proximate to a firm's headquarters have a systematically larger portfolio share in a firm than other funds and whether this effect is accentuated when the VIX increases.

This is precisely what we find in Table 4. In column 1, fund managers always appear to hold a larger portfolio share in firms with headquarters in the same state as their management company. This effect increases as the VIX increases. Similarly, in column 2, where we measure the distance of the firm's headquarters from the fund manager's management company, it appears that fund managers decrease to a larger extent their holdings in distant companies as the VIX increases.

Since firm characteristics have been absorbed in the interactions of firm and time fixed effects, these tests statistically demonstrate that changes in firm characteristics, such as a change in the liquidity of local stocks, cannot drive our findings. Thus, proximity seems to matter more to fund managers when market conditions deteriorate, consistent with the predictions of ambiguity aversion theories.

5. Stock Price Effects of Changes in Preference for Local Stocks

5.1 Local Ownership and Firm level Selling Pressure

As discussed in Subsection 2.2, an implication of the time-varying preference for local stocks of individual mutual funds is that stocks with ex ante higher local mutual fund ownership are expected to experience less selling pressure when aggregate market volatility surges. As a consequence, the patterns we uncovered in Section 4 may have implications for stock valuations and returns.

In this section, before exploring the implications of the time-varying preference for local stocks on stock valuations and returns, we verify that during periods of high aggregate market volatility, the behavior of individual mutual funds indeed translates into higher selling pressure for firms that had lower local mutual fund ownership prior to the increase in aggregate market volatility.

We measure selling pressure using the net sales experienced by a firm, defined as the difference between the shares held by mutual funds in the previous quarter and the current quarter, divided by the firm's number of shares at the beginning of the quarter. A positive value indicates net sales while a negative value indicates net purchases. We measure local mutual fund ownership as the proportion of a firm's shares outstanding held by in-state mutual funds and label this variable IO State.

We capture aggregate market volatility using the VIX, as in the previous section, and define periods with high VIX as periods during which the VXO index exceeds its 75th percentile. This allows us to concentrate on periods of extreme aggregate market volatility, such as the recent financial crisis. These are precisely the periods during which the fund level analysis predicts that we should observe large portfolio rebalancing in favor of local stocks. Thus, we expect local mutual funds ownership to translate in less selling pressure only in periods of high VIX.

The results are presented in Table 5. Consistently with our earlier results, in column 1, while all firms experience a reduction in the shares held by mutual funds in high VIX periods, firms with higher local ownership experience less selling pressure (i.e., the interaction between IO State and High VIX obtains a positive coefficient), thus confirming our investor level analysis. This result is robust to controlling for firm fixed effects, total mutual fund ownership (IO), and other firm characteristics that are known to be associated with larger sell-offs during periods of market turmoil, such as firm liquidity and return volatility. Importantly, the finding remains unaltered if we interact firm characteristics with the dummy capturing high VIX periods (column 2). The results are also robust to the inclusion of interaction of state and time fixed effects (column 3).

The effect is also economically significant. In column 1, during high VIX periods, a one-standard deviation increase in IO State decreases the net sales experienced by the average firm by over 8%.[6] In what follows, we explore whether these effects materially affect firms' valuations and returns during periods of high aggregate market volatility.

5.2 Firm Valuations

Because of the time-varying preference for local stocks, stocks with more local mutual funds' ownership experience positive (or less negative) shocks to demand relative to stocks with few local investors during high VIX periods. If arbitrage capital from other investors is slow to arrive, as is likely to be the case during financial crises (Duffie, 2010), we expect stocks with higher ex ante local mutual fund ownership, that is, the stocks that experience less selling pressure in high VIX periods, to have higher valuations during these periods, but less so in low VIX periods when the preference for local stocks decreases.

In Table 6, we explore how local mutual funds' ownership at the end of the previous quarter is related to firms' valuations, as proxied by the firm's market-to-book value of equity, distinguishing between periods of high and low aggregate market volatility. To reduce the influence of outliers, we take the natural logarithm of the market-to-book value ratio, although results are qualitatively unaffected by this transformation.

We include a host of firm characteristics that could influence market-to-book ratios, including firm size, leverage, tangibility, performance, liquidity, stock return volatility and R&D activity, together with two-digit SIC codes industry fixed effects. All firm-level independent variables are lagged one period. In column 5, we further interact these firms' characteristics with the high VIX dummy, as firms with certain characteristics, such as larger and more liquid firms, may be subject to more selling pressure and experience larger drops in valuation during periods of high aggregate market volatility.

It appears that only during periods of high aggregate market volatility, higher local mutual fund ownership is associated with higher firm valuations. This effect does not emerge during

[6] The economic effect is obtained by multiplying the coefficient of -0.021 in column 1 by the standard deviation of IO State in this subsample (0.014) and dividing by the average net sales in a firm (0.0036).

normal times, thus suggesting that there are reversals in the difference between the valuations of stocks with high local ownership and stocks with low local ownership when the VIX declines. We also do not find similar effects for the firm's overall mutual fund ownership, whose effect does not appear to be consistent across specifications.

Our main result on the influence of local mutual fund ownership during periods of high aggregate market volatility is unaffected when we completely absorb state level shocks by including interactions of state and time fixed effects (column 3). The effect is not only statistically but also economically significant: for a firm with an average logarithm of the market-to-book ratio, the estimates in column 3 indicate that a one-standard-deviation increase in local mutual fund ownership leads to 5.5% higher valuation during periods of high VIX.[7]

While these results are consistent with the changes in demand for local and distant stocks that we highlighted in earlier tests, the concern arises that local mutual funds may be better able at selecting stocks whose prices drop to a lower extent during periods of high aggregate market volatility. To evaluate the possibility of this alternative explanation, we start by lagging local mutual funds ownership by four quarters, instead of only one quarter as in the baseline regression. It is unlikely that local fund managers may have been able to predict changes in the VIX and their effects on firms at this earlier date. It is thus reassuring to find that our results are invariant if we lag the ownership variable by four quarters (column 4).

The regression in column 6 addresses the same criticism using the geographical distribution of mutual funds' assets and firms. Firms' ability to attract local mutual funds depends on the geographical distribution of mutual funds' assets and firms. In particular, in locations with a high proportion of mutual funds' assets relative to other locations in the US, we expect more local mutual fund ownership. We thus use as an instrument for mutual fund ownership the proportion of mutual funds' total net assets under management that is in the same state as the firm's headquarters,

[7] This effect is obtained by multiplying the coefficient of 1.949 in column 3 by the standard deviation of IO State in this subsample (0.019), and dividing by the mean of the logarithm of the market-to-book ratio (0.68).

normalized by the total net asset under management of mutual funds in the US at the end of the quarter. For a given amount of mutual fund assets, the concentration of firm assets in a given location also matters for the extent of local mutual fund ownership. Specifically, the degree of local ownership of firms in a given state should be increasing in the amount of mutual fund assets in the state relative to the total size of firms in the state. We thus construct a second instrument for local ownership, the total mutual fund assets in the same state as the firm's headquarters, divided by total book value of assets of all firms within the state. We then estimate our baseline regressions using two stage least squares.[8] Given the nature of our instruments, this test relies on cross-sectional variation across states, i.e., variation in the observations orthogonal to the variation exploited in column 3. It would thus be particularly reassuring to find that results are consistent across these specifications.

Since in this instrumental variable approach we exploit only variation across states over time, we also include controls for income growth and unemployment across states and within the US, using US Census data. The F-test of excluded instruments reported in Table 6 shows that our instruments cannot be considered weak. Our estimates in column 6 remain invariant and indicate that our results are unlikely to depend on the possibility that fund managers select local firms whose stocks are less exposed to aggregate market volatility. Rather, mutual funds' higher demand for local stocks during periods of high aggregate market volatility implies that these firms experience less price pressure.

5.3 Stock returns

If the stock market valuations of firms with high local mutual fund ownership drop less in periods of high VIX, we should expect that the returns of stocks with high local mutual fund ownership remain relatively higher when the VIX suddenly increases. Also, if the prices of stocks

[8] The endogenous independent variable, IO state, enters in the equation also in the interaction term with the high VIX dummy. We instrument the interaction term as well using interactions of the two instruments with the high VIX dummy.

with low local mutual fund ownership drop more when the VIX increases because these stocks experience higher selling pressure, we should observe that their valuations, and therefore their returns, increase to a larger extent when aggregate market volatility subsides and investors' preference for proximity decreases. We thus expect that the returns of stocks with low mutual fund ownership are lower when the VIX goes up and higher when the VIX decreases in comparison to the returns of stocks with high mutual fund ownership. Put differently, we expect that the returns of stocks with high local mutual fund ownership are less negatively exposed to changes in market-wide volatility, which are captured by changes in the VIX and which are often believed to have a negative effect on stock returns (Ang, Hodrick, Xing, and Zhang, 2006).

We test this conjecture by estimating the following model:

$$\tilde{r}_{i,t} = \alpha + \beta_0 \Delta VIX_{i,t} + \beta_1 \Delta VIX_{i,t} \times IO\ State_{i,t-1} + \gamma X_{i,t} + \varepsilon_{i,t}. \quad (6)$$

The dependent variable $\tilde{r}_{i,t}$ is the abnormal return of firm *i* during month *t*, which we compute either from a Fama and French (1993) three-factor model, augmented by Carhart (1997)'s momentum factor, estimated over a minimum of 12 months and a maximum of 48 months, or following Daniel, Grinblatt, Titman and Wermers (1997). When we rely on the latter methodology for computing abnormal returns, we use the traditional characteristic-based benchmarks of Daniel, Grinblatt, Titman and Wermers (1997), who sort stocks according to size quintiles, book-to-market quintiles, and prior return quintiles to benchmark-adjust stock returns (denoted "DGTW"). We then ask whether firms with different ex ante local ownership have a differential exposure to the VIX.

We expect that β_1, the coefficient of the interaction between the change in VIX during the month and the beginning of the period local ownership, is larger than zero if following sudden increases in the VIX index, stocks with less local mutual fund ownership indeed experience lower returns.

A positive β_1 also implies that when the VIX decreases, the stocks of firms with *less* local ownership will have relatively higher returns. Put differently, these stocks are expected to experience larger drops when the VIX increases and then larger reversals when the VIX starts to decrease.

Regressions are estimated using ordinary least squares, with errors clustered at both the firm and the quarter level. Table 7 shows that firms with higher local mutual fund ownership experience higher abnormal returns when the VIX increases, independent of the method used to compute abnormal returns. Put differently, the estimates in Table 7 imply that the valuations of the firms experiencing larger selling pressure in periods of high VIX (as implied by the findings of Table 5) drop to a larger extent when the VIX spikes, and then recover when the VIX drops.

These results are robust if we allow the effect of the VIX to depend on overall mutual funds ownership and if we control for economic activity and unemployment in the state where the firm is headquartered and in the US (columns 3 and 6). The effect is not only statistically significant but also economically large. According to the estimates in column 1, in months with an increase in VIX of 20 points, increasing local mutual fund ownership by one standard deviation would increase the monthly excess return by 0.5% for an average firm.[9]

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

The explanation we have offered for the results so far is that during periods of high aggregate market volatility, mutual funds' preference for in-state stocks increases for behavioral reasons. Thus, stocks with ex ante higher in-state mutual funds' ownership experience less selling pressure and their valuations remain higher during high VIX periods.

A competing explanation is that in anticipation of negative shocks, mutual funds pick stocks that are less exposed to increases in aggregate market volatility and perform better during these

[9] This effect is obtained by multiplying the coefficient of 0.018 in column 1 by the standard deviation of IO State (0.014) and the change in VIX of 20.

periods. If fund managers are particularly good at doing so for local stocks, there could be a selection bias. This explanation is, however, not consistent with the findings in Table 4, where we completely absorb firm characteristics, and in Table 6, where we show that our results are robust to the use of instrumental variables, which should correct for selection bias. Still, in what follows, we further scrutinize this explanation by considering the funds' ex post performance.

If the results were driven by the possibility that the funds' ability to pick local stocks is particularly valuable during periods of high aggregate market volatility, we should observe that mutual funds have higher performance in their portfolio of in-state stocks during these periods, especially in states in which there are relatively few mutual funds. Otherwise, competition by many mutual funds for the relatively few local stocks would allow the positive private information to be impounded in prices and the funds should *not* experience stronger performance in their local stock portfolio.

On the contrary, if strong demand by local mutual funds during period of high aggregate market volatility indeed drives our findings, we should expect the outperformance of mutual funds on their portfolio of in-state stocks to be stronger in periods with high VIX and in states with relatively more mutual fund assets, where the aggregate effects of the time-varying preference for local stocks are expected to be stronger.

6.1 Methodology to Assess Mutual Fund Performance

To test to what extent the changes in local bias we have documented affect mutual funds' performance, we compare the returns of the funds' in-state investments to their out-of state holdings under different market conditions and between states with high and low mutual funds' demand for local stocks.

For the purpose of this analysis, it is critically important to control for risk when comparing the returns of the portfolios of local and distant stocks. After all, in-state stocks held by mutual funds may simply be riskier than out-of-state stocks, for instance, because mutual funds invest more in small in-state firms or because mutual funds tend to be located close to risky stocks. For this reason, we adjust the return of each individual stock for risk using the risk adjustment method proposed by Daniel, Grinblatt, Titman and Wermers (1997).

After having computed risk-adjusted stock returns, we compute the monthly risk-adjusted returns of the in-state and out-of-state portions of each mutual fund's portfolio. For fund *j* at time *t*, the returns of the in-state and out-of-state portfolios are calculated as:

$$\tilde{R}^{L}_{j,t}=\Sigma_{i=1}^{L_{j,t}} w^{L}_{i,j,t}\tilde{r}_{i,t+z}, \tag{7}$$

and

$$\tilde{R}^{D}_{j,t}=\Sigma_{i=1}^{D_{j,t}} w^{D_{i,t}}_{i,j,t}\tilde{r}_{i,t+z}, \tag{8}$$

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

6.2 Performance of the In-state and Out-of-State Stock Portfolios

We compare the performance of the in-state and out-of-state portfolios for the funds in our sample during the whole sample period and, more importantly for our purposes, during periods of high and low aggregate market volatility. As before, we define high (low) aggregate market volatility as quarters during which the VIX index exceeded (was below) its 75th percentile.

The results are reported in Panel A of Table 8.[10] Local holdings outperform distant holdings by almost 1% per annum during the entire sample period, a magnitude similar to the one reported by Coval and Moskowitz (2001) for a different sample. Local holdings also outperform local stocks in which fund managers do not invest.

[10] Note that the difference in performance between high and low VIX periods in column 4 of Panel A cannot be obtained simply by taking the difference between the average performance reported in columns 2 and 3 because some funds enter and others drop from the sample over the sample period.

The outperformance of in-state stocks compared to out-of-state stocks is statistically larger during periods of high aggregate market volatility. Similarly, in-state stocks outperform in-state stocks that are not held by the fund to a greater extent during periods of high aggregate market volatility (with the difference being statistically significant at the 1% level).

These findings that fund managers earn higher abnormal returns on local stocks during periods of high aggregate market volatility (relative to normal periods) could be consistent with a relative increase in the holdings of in-state stocks driven by a stronger informational advantage over local stocks during these periods. Such an informational advantage would imply that funds experience higher returns in areas in which the mutual funds' demand for stocks is small relative to the supply of local stocks, because funds should face less competition in exploiting their informational advantage in these areas and information should be more slowly impounded in prices.

As before, we proxy for local demand using the one quarter lag of the ratio of in-state mutual funds' total net assets under management to the total book value of assets of firms in the state. We define areas to have high local demand if this ratio is above the top quartile to focus on the most extreme portfolios. All remaining areas are defined to have low local demand. In Panel B of Table 8, we find that the difference in performance between the portfolios of local and distant stocks in high- and low-VIX periods is entirely driven by funds located in zip codes with *high* local demand. We find no difference in performance between high and low VIX periods for funds in areas with relatively low local demand.

It is also reassuring to find that, consistently with previous literature (e.g. Coval and Moskowitz, 2001), the outperformance of local holdings is larger for mutual funds in areas with low local demand during low VIX periods.

This evidence does not support the view that a change in informational advantage drives our results and indicates that the difference in performance is driven by the volatility-induced trades of the fund managers. The demand for stocks that are disproportionately held by distant mutual funds drops more than the demand for stocks disproportionately held by local mutual funds during high VIX periods. This translates into the observed differences in the performance of local stock portfolios in high and low local demand areas during these periods.

Importantly, the fund managers' performance does not deteriorate because of these changes in local bias and actually improves if funds are located in areas with high local demand. However, individual fund managers' changes in local bias are not larger in areas with high local demand (column 1 in Panel B of Table 3) indicating that fund managers do not necessarily anticipate the higher returns of local stocks in these areas. Thus, these results fully support the conjecture that the time-varying preference for local stocks is driven by familiarity biases.

7. Conclusions

We show that mutual fund investors tend to liquidate disproportionately the stockholdings of out-of-state firms during periods of high aggregate market volatility. These results indicate that even within a country, in the absence of political and institutional barriers, the preference for geographically close investments becomes stronger during periods of high aggregate market volatility. Since investors are likely to lack familiarity for foreign assets to a larger extent than for distant assets within a relatively homogeneous country, such as the US, we expect the effects we highlight to be even stronger in an international context.

The time-varying changes in the preference for proximate investments associated with varying market conditions we identify matter for stock prices and the performance of mutual funds. Local mutual funds appear to mitigate the negative effect of (unexpected) increases in aggregate market volatility on stock prices. On the contrary, stocks held predominantly by remote mutual funds may experience larger selling pressure and tend to have lower valuations during periods of market stress. This suggests that investors' preference for local stocks may decrease the benefits of financial integration. We believe that this is an exciting area for future research.

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Table 1. Variable Definitions and Descriptive Statistics

This table presents definitions and summary statistics of our main regression variables, grouped by unit of observation.

Variable	Definition	Mean	St. dev.	N
Panel A: Fund-Time Level				
Local bias-State ($bias_{state}$)	Defined as $\frac{w_{j,t}^{in\ state}-w_{market,t}^{in\ state}}{w_{market,t}^{in\ state}}$, where $w_{j,t}^{in\ state}$ is the portfolio share of fund j in in-state stocks at the end of quarter t and $w_{market,t}^{in\ state}$ is the weight if in-state stocks in the market capitalization at the end of quarter *t*.	0.33	3.6	80592
Local bias-Distance ($bias_{distance}$)	Defined as $\overline{d}_{j,t}^{\ benchmark} - \overline{d}_{j,t}$, where $\overline{d}_{j,t}^{\ benchmark}$ is the weighted average of the distance of the headquarters of all stocks from fund *j*'s management company, computed using as weights the weight of each stock in the market capitalization at the end of quarter *t*; $\overline{d}_{j,t}$ is computed as $\overline{d}_{j,t}^{\ benchmark}$ but using as weights the weight of the stocks in fund *j*'s portfolio. The distance is measured in kilometers.	617	397	80592
Change in the holdings of distant vs local stocks ($\Delta Distant\ vs. Close$)	Defined as $\frac{\sum_{i=1}^{D_{j,t}}(shares_{i,j,t}^{D}-shares_{i,j,t+1}^{D})p_{i,t}}{\sum_{i=1}^{D_{j,t}} shares_{i,j,t}^{D} p_{1,t}} - \frac{\sum_{i=1}^{L_{j,t}}(shares_{i,j,t}^{L}-shares_{i,j,t+1}^{L})p_{i,t}}{\sum_{i=1}^{L_{j,t}} shares_{i,j,t}^{L} p_{1,t}}$, where $shares_{i,j,t+1}^{D}$ is the number of shares held by fund *j* in out-of-state (D) stock *i* at the end of quarter *t+1* and $shares_{i,j,t+1}^{L}$ is the number of shares held by fund *j* in in-state (L) stock *i* at the end of quarter *t+1*. All positions are evaluated using beginning of quarter prices ($p_{1,t}$). Multiplied by 100.	-7.0	73	70726
Net flows	The net flows experienced by the fund during the quarter, divided by the fund's total net assets under management at previous quarter end.	0.03	0.1	82567
Fund return	The average monthly return of the fund during the quarter.	0.02	0.1	83297
Turnover	The minimum of the absolute values of buys and sells of a fund in a given quarter, divided by the total holdings of the fund at the end of previous quarter.	0.42	0.12	83832
TNA	The natural logarithm of total net assets (in 10,000 US$) of the fund at quarter end.	9.8	2.0	80578
Active fund	A dummy variable that takes value equal to one if the Active Share variable of Cremers and Petajisto (2009) indicates that the fund portfolio deviates from an index by more than 80 percent, and zero otherwise.	0.71	0.45	83832
High bias fund	A dummy variable that takes value equal to one if the fund bias is approximately in the top quartile, and zero otherwise.	0.28	0.45	83832
Small fund	A dummy variable that takes value equal to one for funds with TNA below the median, and zero otherwise.	0.5	0.5	83832
Team managed fund	A dummy variable that takes value equal to one if the fund is team managed, and zero otherwise.	0.83	0.38	83832
Inexperienced fund manager	A dummy variable that takes value equal to one if the most experienced fund manager of a	0.13	0.33	83832

Variable	Definition	Mean	St. dev.	N
	fund has less than five years of experience managing funds, and zero otherwise.			
Panel B: Time Level				
VIX	The average VXO index during a quarter.	21	8.3	94
Uncertainty	The average of the index of macroeconomic uncertainty constructed by Baker, Bloom and Davis (2012) during a quarter.	10	2.7	94
Recession	A dummy that takes value equal to one if a NBER recession occurs during a quarter, and zero otherwise.	0.16	0.36	94
Sentiment	Baker and Wurgler (2007) proxy for market sentiment orthogonalized to macroeconomic factors.	0.091	0.53	94
Market Return	The average monthly return of the S&P500 index in percentage during a quarter.	0.68	2.8	96
Panel C: Firm-Time Level				
M/B ratio	The market-to-book ratio of the firm at quarter end.	2.8	3.1	311531
Net sales	The net sales experienced by a firm defined as the shares held by mutual funds between the previous quarter and the current quarter, divided by the firm's number of shares at the beginning of the quarter.	0.0036	0.019	310728
IO state	The proportion of the firm's shares outstanding held by mutual funds with management company in the same state as the firm's headquarters.	0.0045	0.014	326284
IO	The proportion of the firm's shares held by mutual funds.	0.065	0.07	326284
%TNA State	The fraction of the total net asset value of mutual funds located in the same state as the firm's headquarters.	0.065	0.10	308204
Fund Assets State/Firm Assets State	The ratio of the total net asset value of mutual funds located in the same state as the firm's headquarters to the total assets of all firms in that state. Multiplied by 100.	16	36	282301
Leverage	The ratio of debt to total assets of the firm at quarter end.	0.42	0.41	258447
Profitability	Pre-tax return on assets of the firm at quarter end.	0.0073	0.15	319005
Liquidity	The average trading volume of the stock divided the stock market valuation at quarter end.	0.00014	0.0012	324431
Mkt Cap	The natural logarithm of the market capitalization of the firm at quarter end.	20	1.8	326249
Return	The average monthly stock return of the firm over the quarter.	-0.29	0.23	265213
Size	The natural logarithm of the firm's total assets.	6.1	1.9	303154
Tangibility	The ratio of the firm's fixed assets to total assets.	0.26	0.24	309069
R&D expense	The ratio of the firm's R&D expense to sales.	1.1	55	318918
R&D expense missing	A dummy variable that takes a value of one if the firm's R&D expense is missing and is zero otherwise.	0.64	0.48	303284
Volatility	The standard deviation of the firm's daily returns.	0.14	0.10	139853
Panel D. Fund-Firm-Time Level				

Variable	Definition	Mean	St. dev.	N
Portfolio share	The portfolio share of fund *j* in stock *i* at the end of quarter *t*, computed using end of quarter stock prices. Multiplied by 100.	0.99	1.5	8568045
Same state	A dummy variable that takes a value equal to 1 if the management company of fund *j* is located in the same state as the headquarters of the firm with stock *i*, and zero otherwise.	0.7	0.26	8568045
Distance	The distance in km, divided 10000, between the zip code of the management company of fund *j* and the headquarters of the firm with stock *i*.	1800	1300	8568045

Table 2. Portfolio Rebalancing and Stock Market Conditions

This table reports fund level regressions using quarterly data over the period 1986-2009. In column 1 and 2, the dependent variables are Local Bias-Distance and Local Bias-State. In columns 3 to 7, the dependent variable is $\Delta Distant\ vs. Close, \Delta Distant\ vs. Close,$ the change in value of the holdings of distant stocks, relative to the beginning-of-the-quarter holdings of distant stocks, minus the change in the value of the holdings of local stocks, relative to the beginning-of-the-quarter holdings of local stocks. All variables are defined in Table 1. Regressions are estimated using OLS and include fund fixed effects and a constant term whose coefficients are not reported. Errors are clustered at the calendar quarter level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Local Bias-Distance	Local bias-State	Change in the holdings of distant vs. local stocks				
VIX	3.207***	0.002**	-0.062**				-0.087***
	(1.172)	(0.001)	(0.026)				(0.032)
Uncertainty				-0.347***			
				(0.078)			
Recession					-2.123***		
					(0.755)		
Sentiment						1.585***	
						(0.480)	
Market Return							-0.155
							(0.117)
Net flows, lagged one quarter	-14.587	0.046	2.744	1.504	1.675	2.657	2.861
	(24.105)	(0.070)	(3.181)	(3.151)	(3.108)	(3.161)	(3.173)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	79693	79693	69495	69709	69709	69709	69495
R-squared	.666	.640	.173	.172	.172	.172	.173

Table 3. Fund Portfolio Rebalancing and Fund Characteristics

This table reports fund level regressions using quarterly data over the period 1986-2009. The dependent variable is $\Delta Distant\ vs.Close,$ the change in value of the holdings of distant stocks, relative to the beginning-of-the-quarter holdings of distant stocks, minus the change in the value of the holdings of local stocks, relative to the beginning-of-the-quarter holdings of local stocks. All values are computed using beginning of quarter prices. In column 2 of Panel B we exclude all funds whose management company is located in CA, MA, and NY, while in column 3 we include only funds whose management company is in CA, MA, and NY. All variables are defined in Table 1. Regressions are estimated using OLS and include fund fixed effects and a constant term whose coefficients are not reported. Errors are clustered at the calendar quarter level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

Panel A.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VIX	-0.057**	-0.062**	-0.060**	-0.070**	-0.059**	-0.013	-0.158**	-0.052*
	(0.027)	(0.026)	(0.026)	(0.027)	(0.029)	(0.038)	(0.064)	(0.026)
High bias fund × VIX					-0.071			
					(0.099)			
Small fund × VIX						-0.110*		
						(0.058)		
Team managed fund × VIX							0.118*	
							(0.070)	
Inexperienced fund manager × VIX								-0.073
								(0.062)
Net flows, lagged one quarter	3.621	3.012	2.513	4.311	4.183	3.320	3.006	2.223
	(5.721)	(3.210)	(3.166)	(3.326)	(3.177)	(3.183)	(3.162)	(3.199)
Net flows, lagged two quarters	-3.165							
	(7.427)							
Net flows, lagged three quarters	0.325							
	(5.913)							
Net flows, lagged four quarters	4.483							
	(4.418)							
Fund return, previous quarter		-4.702						
		(6.071)						
Turnover			-0.120**					
			(0.054)					
Active fund			-0.425					
			(0.783)					
TNA, previous quarter				0.413				
				(0.320)				
High bias fund					-4.887*			
					(2.595)			
Small fund						-0.509		
						(1.479)		

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Team managed fund							0.443	
							(1.892)	
Inexperienced fund manager								5.506***
								(1.880)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	65421	69495	69495	67375	69495	69495	69495	69495
R-squared	.178	.173	.174	.172	.173	.173	.173	.173

Panel B.

	(1)	(2)	(3)
		Excluding CA, NY, MA	CA, NY, MA
VIX	-0.104***	-0.102**	-0.055*
	(0.032)	(0.044)	(0.030)
VIX× Fund Assets State/Firm Assets State	0.002**		
	(0.001)		
Net flows, lagged one quarter	2.672	-3.471	-2.712
	(3.180)	(5.390)	(1.722)
Fund Assets State/Firm Assets State	-0.005		
	(0.022)		
Fund FE	Yes	Yes	Yes
Obs	69495	33686	35809
R2	.173	.195	.087

Table 4. Absorbing Fund and Firm Level Unobservable Characteristics

This table reports fund-stock level regressions using quarterly data over the period 1986-2009. The dependent variable is the portfolio shares of fund *j* in stock *i* at the end of quarter *t*. Regressions are estimated using OLS and include 83,547 interactions of fund and time fixed effects, 296,648 interactions of firm and time fixed effects, and a constant term whose coefficients are not reported. Errors are clustered at the calendar quarter level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Same State × VIX	0.002*	
	(0.001)	
Distance× VIX		-0.005*
		(0.003)
Same State	0.019***	
	(0.003)	
Distance		-0.041***
		(0.007)
Fund× Time & Firm× Time FE	Yes	Yes
Obs	8,568,045	8,568,045
R2	.666	.666

Table 5. Local Ownership and Firm Level Selling Pressure

This table reports firm level regressions of mutual funds' net sales using quarterly data over the period 1986-2009. The dependent variable is the net sales experienced by a firm defined as the difference between the shares held by mutual funds between the previous quarter and the current quarter, divided by the firm's number of shares at the beginning of the quarter. IO State is the proportion of the firm's outstanding shares held by local mutual funds. Mutual funds that are located in the same state as the firm's headquarters are defined to be local. IO is the ownership stake in the firm of all mutual funds in our sample. High VIX is a dummy variable that equals 1 in periods during which the VIX index exceeds its 75th percentile, and zero otherwise. All explanatory variables other than the VIX variables are lagged one-quarter period. All remaining variables are defined in Table 1. Regressions are estimated using OLS and include a constant term and fixed effects as indicated in the table whose coefficients are not reported. Column 1 includes firm fixed effects and column 3 includes interactions of state and time fixed effects. Errors are clustered at the firm level and corrected for heteroskedasticity. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
High VIX	0.001***	-0.001	
	(0.000)	(0.000)	
IO State × High VIX	-0.021*	-0.019*	-0.019*
	(0.012)	(0.011)	(0.011)
IO State	0.011	0.007	0.008
	(0.013)	(0.008)	(0.007)
IO × High VIX	0.001	0.009***	0.008***
	(0.002)	(0.002)	(0.002)
IO	0.128***	0.076***	0.061***
	(0.002)	(0.002)	(0.002)
Leverage	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Profitability	-0.002*	0.001	0.001*
	(0.001)	(0.000)	(0.000)
Tangibility	-0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)
Mkt Cap	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Liquidity	0.125	0.166	0.056
	(0.113)	(0.187)	(0.088)
Past return	0.006***	0.009***	-0.004***
	(0.000)	(0.001)	(0.000)
Volatility	0.020***	0.022***	0.012***
	(0.002)	(0.001)	(0.001)
Leverage × High VIX		-0.000	
		(0.000)	
Profitability × High VIX		-0.001**	
		(0.001)	
Tangibility × High VIX		0.000	
		(0.001)	
Mkt Cap × High VIX		-0.000***	
		(0.000)	
Liquidity × High VIX		0.009	
		(0.207)	
Past Return × High VIX		-0.011***	
		(0.001)	
Volatility × High VIX		-0.013***	
		(0.001)	
Firm FE	Yes	No	No
State × Time FE	No	No	Yes
Obs	106372	106372	106190
R2	.146	.093	.310

Table 6. Local Ownership, Market Conditions, and Firm Valuation

This table reports firm-level regressions of market-to-book ratios using quarterly data over the period 1986-2009. The dependent variable is the natural logarithm of the market-to-book ratio. IO State is the proportion of the firm's outstanding shares held by local mutual funds. Mutual funds that are located in the same state as the firm's headquarters are defined to be local. IO is the ownership stake in the firm of all mutual funds in our sample. High VIX is a dummy variable that equals 1 in periods during which the VIX index exceeds its 75^{th} percentile, and zero otherwise. All explanatory variables other than the VIX variables are lagged one-quarter period. Columns 1 to 5 report pooled OLS regressions with clustering at the firm level. In column 6, we report two stage least squares estimates in which IO State and IO State × High VIX have been instrumented, respectively, using %TNA State and Fund Assets State/Firm Assets State and %TNA State × High VIX and Fund Assets State /Firm Assets State × High VIX, where %TNA State is the fraction of the total net asset value of mutual funds located in the same state as the firm's headquarters and Fund Assets State /Firm Assets State is the ratio of the total net asset value of mutual funds located in the same state as the firm's headquarters to the total assets of all firms in that state. Column 6 also present the first stage coefficients of the regressions of IO State on %TNA State and Fund Assets State /Firm Assets State and the controls included in the second stage (the coefficients for the controls are not reported). State income growth is the growth rate of state-level income. State unemployment rate is the seasonally-adjusted state-level unemployment rate. US income growth is the growth rate of income for the United States. US unemployment rate is the seasonally-adjusted unemployment rate for the United States. All remaining variables are described in Table 1. All regressions include 2-digit SIC industry fixed effects, a constant and other fixed effects as indicated in the table whose coefficients are not reported. Standard errors are clustered at the firm level and reported between brackets. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
High VIX	-0.306***	-0.318***		-0.303***	-0.423***	-0.302***
	(0.008)	(0.011)		(0.008)	(0.032)	(0.012)
IO State	-0.191	-0.120	-1.117**		0.000	1.635
	(0.521)	(0.521)	(0.553)		(0.519)	(1.628)
IO State × High VIX	1.501***	1.277***	1.949***		0.978**	4.652***
	(0.429)	(0.450)	(0.483)		(0.447)	(1.430)
IO State, fourth lag				-0.688		
				(0.538)		
IO State, fourth lag × High VIX				1.543***		
				(0.410)		
IO	0.606***	0.558***	0.728***	0.723***	0.660***	0.508***
	(0.118)	(0.121)	(0.125)	(0.118)	(0.121)	(0.157)
IO × High VIX		0.145*			-0.174*	0.399***
		(0.085)			(0.090)	(0.127)
Size	0.004	0.004	0.008	0.011	-0.011	0.004
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Leverage	0.686***	0.686***	0.720***	0.696***	0.800***	0.704***
	(0.054)	(0.054)	(0.055)	(0.057)	(0.056)	(0.057)
Tangibility	-0.282***	-0.282***	-0.229***	-0.258***	-0.271***	-0.258***
	(0.063)	(0.063)	(0.065)	(0.064)	(0.064)	(0.069)
Profitability	0.591***	0.591***	0.571***		0.654***	0.525***
	(0.180)	(0.180)	(0.166)		(0.190)	(0.144)
R&D expense	0.000*	0.000*	0.000	0.000*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

	(1)	(2)	(3)	(4)	(5)	(6)
R&D missing	-0.338***	-0.338***	-0.308***	-0.337***	-0.329***	-0.322***
	(0.023)	(0.023)	(0.025)	(0.024)	(0.024)	(0.025)
Liquidity	-20.612	-20.647	-18.555	-17.137	-41.503**	-18.163
	(15.673)	(15.721)	(14.219)	(13.401)	(16.460)	(13.699)
Volatility	-0.233***	-0.233***	-0.181**	-0.418***	-0.265***	-0.105
	(0.085)	(0.085)	(0.089)	(0.089)	(0.087)	(0.086)
Size × High VIX					0.044***	
					(0.004)	
Leverage × High VIX					-0.315***	
					(0.044)	
Tangibility × High VIX					-0.030	
					(0.030)	
Profitability × High VIX					-0.121**	
					(0.058)	
R&D expense × High VIX					0.000	
					(0.000)	
R&D missing × High VIX					-0.026*	
					(0.014)	
Liquidity × High VIX					23.430	
					(22.123)	
Volatility × High VIX					0.084	
					(0.077)	
State income growth						0.037***
						(0.005)
State unemployment rate						0.012
						(0.010)
US income growth						0.032***
						(0.005)
US unemployment rate						-0.045***
						(0.010)
First Stage Coefficient on						
%TNA State						0.033***
						(0.001)
Fund Assets State/Firm Assets State						0.0001***
						(0.000)
State*Time FE	No	No	Yes	No	No	No
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
F-test of excluded instruments						39.71
Obs	102407	102407	102235	97119	102407	90487
R2	.180	.180	.233	.188	.182	.195

Table 7. Local Ownership, Market Conditions, and Firm's Stock Returns

This table relates a firm's monthly excess returns to changes in VIX (ΔVIX) and mutual fund ownership over the period 1986-2009. In columns 1 to 3, we estimate excess returns from a Fama and French (1993) three-factor model augmented by Carhart (1997)'s momentum factor over a minimum of 12 months and a maximum of 48 months. In columns 4 to 6, excess returns are estimated following Daniel et al.'s (1997) procedure (denoted as "DGTW"). We then relate firm-level excess returns at the end of each quarter to contemporaneous changes in VIX and mutual funds' ownership at the end of the previous quarter. IO State is the proportion of the firm's outstanding shares held by local mutual funds. Mutual funds that are located in the same state as the firm's headquarters are defined to be local. IO is the ownership stake in the firm of all mutual funds in our sample. State income growth is the growth rate of the state-level income. State unemployment rate is the seasonally-adjusted state-level unemployment rate. US income growth is the growth rate of income for the United States. US unemployment rate is the seasonally-adjusted unemployment rate for the United States. All remaining variables are described in Table 1. All regressions include a constant (not reported). The table reports parameter estimates from pooled ordinary least squares regressions with errors clustered at the firm and quarter level. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Abnormal returns methodology:		Fama-French			DGTW	
IO State × ΔVIX	0.018*	0.021*	0.025**	0.008*	0.009*	0.008*
	(0.011)	(0.011)	(0.011)	(0.005)	(0.005)	(0.005)
ΔVIX	0.002	0.003	0.004	0.000	0.000*	0.000*
	(0.003)	(0.003)	(0.003)	(0.000)	(0.000)	(0.000)
IO State	0.103	0.040	0.086	-0.014	-0.019	-0.018
	(0.074)	(0.075)	(0.070)	(0.038)	(0.042)	(0.042)
IO × ΔVIX	-0.054***	-0.057***	-0.037***	-0.001	-0.001	-0.001
	(0.019)	(0.019)	(0.014)	(0.001)	(0.001)	(0.001)
IO	0.211*	0.225*	0.153	-0.002	-0.002	-0.004
	(0.110)	(0.117)	(0.096)	(0.008)	(0.009)	(0.009)
Leverage		0.029***	0.036***		0.003	0.003
		(0.009)	(0.009)		(0.004)	(0.004)
Profitability		-0.050	-0.042		0.012	0.012
		(0.037)	(0.029)		(0.014)	(0.014)
Tangibility		0.001	-0.008		-0.002	-0.002
		(0.012)	(0.011)		(0.003)	(0.003)
Size		0.000	0.000**		0.000	0.000
		(0.000)	(0.000)		(0.000)	(0.000)
Liquidity		46.740**	26.011		-1.291	-1.386
		(22.372)	(16.300)		(2.814)	(2.781)
Volatility		-0.019	0.005		0.004	0.003
		(0.055)	(0.051)		(0.005)	(0.004)
State income growth			0.000			0.001
			(0.003)			(0.001)
State unemployment rate			0.001			0.001
			(0.002)			(0.001)
US income growth			-0.044***			-0.002

			(0.015)			(0.002)
US unemployment rate			0.060***			-0.002**
			(0.012)			(0.001)
Obs	223997	175414	175247	198734	161063	161005
R^2	.0129	.0154	.1	.000237	.000639	.000866

Table 8. Performance of Local and Distant Fund Holdings

This table reports annualized risk-adjusted monthly returns for local and distant fund holdings, with local holdings defined as stocks located in the same state as the management company of the fund manager. 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). The table also reports the average difference in risk-adjusted returns between local and distant portfolios, the risk-adjusted return of local stocks not being held by local funds, the difference in risk-adjusted returns of local and local not held portfolios. Statistics in panel A are reported separately for periods of low and high aggregate market volatility – and for differences between periods of high and low aggregate market volatility – with high (low) aggregate market volatility defined as quarters during which the average VIX index exceeds (is below) its 75th percentile. Annualized returns are expressed in percentages, with standard deviations between parentheses and t-statistics reported between square brackets. Statistics in panel B are reported separately for states with high or low local demand. A state is defined to have high local demand if the one-quarter lagged ratio of the total net assets under management of mutual funds located within the state to the total assets of firms in the state exceeds its 75th percentile. All remaining states are defined to have low local demand. Statistics in panel B are also reported for differences between periods of high and low aggregate market volatility, and for differences between high and low local demand during periods of high aggregate market volatility. Annualized returns are expressed in percentages, with standard deviations between parentheses and t-statistics reported between square brackets.

Panel A: Local and Distant Portfolios during High and Low VIX Periods

Portfolio	All periods	High VIX	Low VIX	High VIX − Low VIX
Local	0.86	1.53	0.58	0.93
	(0.18)	(0.41)	(0.19)	[2.35]
Distant	0.06	0.13	0.03	0.25
	(0.01)	(0.04)	(0.00)	[6.59]
Local – Distant	0.79	1.40	0.55	0.85
	[4.39]	[3.40]	[2.87]	[2.13]
Local, Not Held	0.04	0.07	0.03	0.08
	(0.00)	(0.00)	(0.00)	[6.66]
Local – Local, Not Held	0.82	1.45	0.57	0.89
	[4.56]	[3.55]	[2.95]	[2.23]
	[2.71]	[2.83]	[1.12]	[2.27]

Panel B: High and Low Local Demand Areas

Portfolio	High VIX: High Local Demand	High VIX: Low Local Demand	Low VIX: High Local Demand	Low VIX: Low Local Demand	High VIX − Low VIX: High Local Demand	High VIX − Low VIX: Low Local Demand	High VIX: High Local Demand – Low Local Demand
Local	2.72	1.35	0.31	0.66	2.41	0.69	1.37
	(0.81)	(0.46)	(0.39)	(0.21)	(0.80)	(0.45)	[1.52]
Distant	0.33	0.25	0.03	0.06	0.30	0.19	0.08
	(0.11)	(0.04)	(0.01	(0.01)	(0.07)	(0.03)	[0.83]
Local – Distant	2.69	1.26	0.29	0.61	2.39	0.64	1.43
	[3.32]	[2.74]	[0.76]	[2.86]	[2.99]	[1.45]	[1.59]

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