Is There Information in the Local Portfolio Choices of Individuals?

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Abstract

We use calendar-time portfolios and transaction-level data to test if individual investors have any value-relevant information. Individual investors are poor at picking stocks. Stocks bought over the past twelve months under-perform stocks sold by 2.18% per annum (1.38% on a risk-adjusted basis). We divide each individual's portfolio into local and remote stocks. Portfolios of local stocks do not significantly outperform portfolios of remote stocks. At times, local portfolios actually *under-perform* remote portfolios. Our results are robust to one-, three-, and five-year holding periods; equal- and value-weighted portfolio formation methods; and the consideration of non S&P 500 stocks. There is simply no evidence that individuals have information about the local stocks in their portfolios. Our results differ from previous studies of individual investor geography because we correctly account for the fact that stock returns are contemporaneously correlated.

Keywords: Home Bias, Informed Trading, Familiarity

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1 Introduction

Since early work by French and Poterba (1991), financial economists have been puzzled by the apparent lack of international portfolio diversification. Investors have over 90% of their equity holdings in domestic stocks. This so-called "home bias" puzzle has spawned a large literature.[1] Over the past five years, researchers have been focusing on *intra-national* investment patterns. Coval and Moskowitz (1999) show that U.S. investment managers tend to invest in locally-headquarted stocks. The behavior of investing locally is even more pronounced for individuals and has been documented in the United States, Finland, and China.[2]

The propensity of investors to tilt their portfolios towards locally-headquartered stocks has given rise to a debate: Are portfolio choices based on value-relevant information? Or, are choices based on non value-relevant factors (commonly referred to as "familiarity") as Huberman (2001) finds? Coval and Moskowitz (2001) present compelling evidence that the average fund manager generates an additional return of 2.67% percent per year from her local investments (defined as holdings within 100 kilometers of the fund's headquarters) relative to her non-local holdings. The authors write:

> *Managers appear to earn abnormal returns in their local holdings as compensation for information they may acquire about local companies. This information may be the result of improved monitoring capabilities or access to private information of geographically proximate firms. . . . [Regions of the United States] in which local information may be more valuable and more difficult for outsiders to obtain, such as small cities and remote locations, offer larger profits for local investors.*

When it comes to studying *individual investors*, the information versus familiarity debate is far from resolved. Two recent papers fall squarely on one side. Ivkovic and Weisbenner (2005) state "the average household generates an additional annualized return of 3.2% from its local holdings relative to its nonlocal holdings." Such a result is surprising for two reasons.[3] First, the average location-based performance difference is larger for individuals than for professional managers within the United States (3.2% vs. 2.67%). A finding that individuals make value-relevant investments to the same, or greater, degree as professional managers would force economists to re-evaluate the concept of professional manager skill.

[1]Cooper and Kaplanis (1994); Tesar and Werner (1995); Kang and Stulz (1997); and Lewis (1999) are some classic articles in the area of international home bias. The extent of current research on home bias can be seen on SSRN. A search for the words "home bias" in the title or abstract yields 219 matches.

[2]See Grinblatt and Keloharju (2001); Zhu (2003); Feng and Seasholes (2004); and Ivkovic and Weisbenner (2005).

[3]A location-based relative return difference does not preclude individuals from under-performing the overall market. Finding a relative return difference implies that local stocks out-perform remote stocks *within* a given individual's portfolio.

As Ivkovic and Weisbenner (2005) note, the realization of superior returns from local stocks by individuals means the same finding "by professional managers would seem less impressive and should be reinterpreted primarily as the skill to realize that there is investment value in uncovering local information and to collect it, rather than the skill to carry out particularly insightful analyses of such information."

The second reason it is surprising to find a location-based, relative return differences in individual portfolios is that Odean (1999), Barber and Odean (2000), and others have shown that individuals are subject to value-reducing biases. These biases include, but are not limited to: selling winners even though the stocks they sell tend to go up; holding losers even though the stocks tend to go down; and being overconfident which leads to high transaction costs. Interestingly, a second paper, by Massa and Simonov (2004), reaches similar conclusions regarding locality and individual investor portfolio returns in Sweden. The authors write: "an increase in the [investor's] proximity to the stock by a factor of ten (i.e., a move from 100 km to 10 km) increases financial profits by 5.80% for the overall sample."

We test if individual investors are making informed decisions by using calendar-time portfolios and transaction-level data. We begin by estimating overall performance of individual investors and find they are poor at picking stocks. Stocks bought over the past twelve months under-perform stocks sold by 2.18% per annum (1.38% on a risk-adjusted basis). Our finding is important because it shows that the calendar-time methodology, when used in conjunction with our dataset, is capable of detecting statistically and economically significant performance differences. For example, the 2.18% under-performance has a -2.97 T-statistic based on standard errors corrected for heteroscedasticity and serial correlation.

The second step in our analysis is to form four calendar-time/location portfolios based on the location of firms and the location of investors. The portfolios are: A) Local Stocks Bought; B) Local Stocks Sold; C) Remote Stocks Bought; and D) Remote Stocks Sold. The returns of these portfolios provide no evidence of informed investing by individuals. In short, there are no relative return differences *within* investor portfolios. We show that local stocks bought by individual investors do not outperform local stocks sold by individuals. Local stocks sold do not go down more than (do not perform relatively worse than) remote stocks sold. Our results are robust to one-, three-, and five-year holding periods; equal- and value-weighted portfolio formation methods; and the consideration of non S&P 500 stocks. We find that local stocks bought actually *under-perform* local stocks sold. This finding is important because even with more data, the *sign* of this performance difference is opposite to what existing papers imply. The under-performance is marginally significant when measuring equally-weighted portfolio returns.

The results in this paper are based on the same dataset used in Ivkovic and Weisbenner (2005), but contain a number of differences. We use all transactions between 1991 and 1996. The Ivkovic and Weisbenner (2005) findings are based primarily on holdings at the end of 1991. We also account for contemporaneous correlation of returns across household portfolios; Ivkovic and Weisbenner (2005) essentially treat household portfolio returns as independent observations. Assuming observations are independent inflates tests of statistical significance. To see this point, consider that the dataset contains account information for approximately 30,000 households who hold and/or trade a few thousand listed stocks. The number of households is clearly much greater than the number of assets. Over a single time period, the return to any household's portfolio is simply a linear combination of the underlying assets' returns. The number of independent household returns is thus limited by the number of assets and not the number of households.[4]

We contribute to the literature by re-setting the baseline by which we think about information investing and individuals. Two recent papers, Ivkovic and Weisbenner (2005) and Massa and Simonov (2004), both claim that living near a company can lead to more profitable investments. Our paper shows that living near a company does not endow an investor with value-relevant information. Stock returns contain a high degree of contemporaneous correlation. Calendar-time portfolios allow us to account for this correlation while at the same time providing a methodology that, when combined used on our data, is capable of detecting statistically and economically significant performance differences. Interestingly, work in the area of *individual* investor geography has previously not accounted for cross-sectional correlation of stock returns. Our paper proceeds as follows. Section 2 reviews the data and methodology. Section 3 presents our results. Section 4 compares and contrasts our results with previous research. Section 5 provides results from a number of alternative specifications. Our results are robust and our conclusions remain unchanged. Section 6 concludes. Our final section discusses possible directions for future research. We pay particular attention to geographic/intra-national research ideas.

[4]If asset returns are generated by just a few factors in the economy statistical problems become more severe. In such cases, the number of independent household returns is limited by the number of factors and not the number of households (independence is also not limited by the number of stock). The Massa and Simonov (2004) paper uses investor data from Sweden. Since we do not have access to their dataset we concentrate on differences with the study that uses data from the United States. We believe an analysis of the Swedish data would also highlight issues surrounding contemporaneous correlation of stock returns. Appendix 6 outlines differences between our methodology and the methodology used in Massa and Simonov (2004).

2 Methodology and Data

2.1 Data

This paper uses household-level investment data, stock price/return data, firm-level locality data, and S&P 500 Index composition. We describe each below.

Investor Data: Our individual investor data come from a large, discount brokerage house. This is the same data studied extensively in papers such as Barber and Odean (2000) and Ivkovic and Weisbenner (2005). The former paper gives a detailed description of the data. The full dataset contains holding and trading records from 77,795 households. Transaction data start on January 1, 1991 and end on November 30, 1996. Monthly portfolio positions start on January 31, 1991 and end on December 31, 1996. A demographic file with information on a subset of households contains the five-digit zip code where the household is located. Throughout this paper we use the terms "individual" and "household" interchangeably.

Stock Price and Return Data: We use daily stock returns from CRSP. We also use daily market returns, daily risk-free rates, and daily Fama-French factors from Ken French's data library.

Firm-level Data: We obtain firm-level locality for companies with listed common stocks. Each firm's state and county is obtained from Compustat. In total, we identify the locality for 8,773 different CUSIP numbers.

S&P 500 Data: We obtain the history of firms in the S&P 500 from Barclay, Hendeshott, and Jones (2004). The history begins with firms in the S&P 500 as of 1979 and contains updates based on inclusions and deletions. The inclusion data are a slightly updated version of data used in Wurgler and Zhuravskaya (2002).

2.2 Matching of Household Locations with Firm Locations

This paper studies household investments in local and remote (non-local) stocks. We construct a non-parametric (binary) distance-based measure to determine if a holding is local or not. In order to measure the distance between a household and a company, we translate household zip codes into latitudes and longitudes using the 1990 Census U.S. Gazetteer (on the web at www.census.gov). The same publication is also used to identify the latitude and longitude of each firm's headquarters (based on state and county information).[5] The following formula computes the distance between two points $\{a, b\}$ on earth. Latitudes $\{a_1, b_1\}$ and longitudes $\{a_2, b_2\}$ are given in radians and the earth's radius is $r = 6,378$ kilometers or $r = 3,963.19$ miles.

$$\begin{aligned} distance(a,b) &= r \times arccos[(cos(a_1)cos(a_2)cos(b_1)cos(b_2) \\ &\quad + cos(a_1)sin(a_2)cos(b_1)sin(b_2) + sin(a_1)sin(b_1)] \end{aligned} \tag{1}$$

Table 1, Panel A shows the effect of identifying location on our sample size. We start with 77,795 households. We identify locality information for 54,538 (or 70%) of the households. A total of 53,443 households are located in the continental United States. Of the households located in the continental United States, a total of 44,836 households hold at least one U.S.-listed common stock during the sample period. We consider only stocks listed on the NYSE, AMEX, and Nasdaq. Using firm-locality information, we identify 43,132 households with holdings of at least one U.S.-listed common stock where both the household and the stock have locality information.

Table 1, Panel B shows the number of total transactions in our dataset. There are 534,345 buys and 448,977 sells. The total number of transactions is 983,322. There are approximately 19% more buys in the dataset than sells.

2.3 Over-Weighting of Local Stocks

As mentioned in the Introduction, there is ample evidence that individual investors overweight local stocks in their portfolios. We confirm this is the case in our sample. Any stock whose headquarters is within a certain radius of a given household is considered to be local *for that household*. Any stock whose headquarters is outside the same radius is considered remote. In this paper we consider radii of 100 kilometers (km), 100 miles, and 250 miles. The same stock, say Microsoft, is considered to be local for households in the Seattle area and remote for households in New York.

For each investor, we calculate the value-weighted fraction of his portfolio that is invested in local stocks and the value-weighted fraction invested in remote stocks. We only consider

[5] We use zip codes for individuals. However, we are faced with a trade-off when measuring company location. Using only zip codes cuts the sample size. Using state and county information allows us to match more stocks and investors.

listed, US equities (whose headquarters locality is available from Compustat), therefore these two fractions add to one. We also calculate the value-weighted fraction of all stocks in the market that are considered to be local for that investor. An investor is said to over-weight local stocks if the fraction of local stocks in his portfolio is greater than the fraction of available local stocks. Available local stocks (i.e., the fraction of the market) is defined differently for *each particular* investor.

Table 2 presents our results. Panel A defines local/remote with a 100 km radius; Panel B defines local/remote with a 100 mile radius; and Panel C defines local/remote with a 250 mile radius. We consider holdings on December 31^{st} of each year. Investors hold approximately 20% of their portfolio in stocks located within a 100 km radius; approximately 22% in stocks located within a 100 mile radius; and approximately 30% in stocks located within a 250 mile radius.

For each of the three radii, we present three measures of local bias. For each household, we calculate the fraction of the portfolio invested in local stocks. We also calculate the fraction of the market (all stocks) within the same radius. The first measure is the difference between local holdings and available local holdings. It ranges between 13.4% and 18.4% depending on radius but with little variation over time. Notice the difference measure increases as the radius increases (in 1991, 14.1% < 15.3% < 17.7%). The second measure of local bias is the ratio of local holdings to available local holdings. The measure decreases as the radius increases (in 1991, 3.5 > 3.2 > 2.4). The third measure is the natural log of the previous ratio. The measure decreases very slightly as the radius increases (in 1991, 1.2 > 1.1 > 0.9). The three local bias measures are not too material for results in our paper since we focus on a binary classification system: stocks are either local or they are not.

Results in Table 2 confirm that individual investors over-weight local stocks in their portfolios. The results are comparable to existing papers. Ivkovic and Weisbenner (2005) show the typical U.S. household has 31.5% of its portfolio invested in stocks headquartered within a 250 mile radius. Only 12.6% of all firms (the market) are headquartered within the same radius. Using the same sample of U.S. households, Zhu (2003) shows the average distance between an investor and the headquarters of firms in his portfolio is 1,024 miles. The average distance between the investor and all stocks in the market is 1,185 miles. Grinblatt and Keloharju (2001) show that the median non-Helsinki headquartered firm has 12.16% higher weight among investors in its municipality than it does among all investors in Finland. Feng and Seasholes (2004) show individuals in mainland China invest 8.25% more in firms from the province where the investors live than a market-capitalization portfolio would predict. We now turn to investigating whether the over-weighting leads to superior returns (performance) or not.

2.4 Methodology: Calendar-Time Portfolios

To test if individuals (households) have value-relevant information, we measure the performance of *all* their investments made between January 1, 1991 and November 30, 1996. Our methodology involves forming calendar-time portfolios with which we mimic household investment behavior. We "buy" whenever households buy and we "sell" whenever households sell. We consider one-, three-, and five-year holding periods and thus can provide a term-structure to the value-relevant information (if such a term structure exists).

The use of calendar-time portfolios has been shown to be important when analyzing corporate events. Brav and Gompers (1997) use calendar-time portfolios in their study of long-run under-performance of initial public offerings. In more general settings, Barber and Lyon (1997) and Lyon, Barber, and Tsai (1999) detail statistical properties relating to long-run tests of abnormal stock returns. All three papers are primarily focused on corporate finance studies such as the long-run performance of recently listed stocks.

The same methodology used to study long-run returns in corporate finance also works well in studies of investor behavior. Consider asking: do stocks individuals buy outperform stocks individuals sell? The question is similar to asking if recently listed stocks outperform previously-listed stocks. When considering investor behavior, each decision to buy or sell a stock can be thought of as an event. Studies of trading in financial markets typically have thousands or even millions of such events. A large number of events over short time intervals means events are temporally clustered. Clustered financial data requires addressing correlation of residuals when using a regression framework and stock returns. Stocks bought over the same period may exhibit cross-sectional dependence over a given holding period. Lyon, Barber, and Tsai (1999) discuss calendar-time portfolios and write "this approach eliminates the problem of cross-sectional dependence among sample firms because the returns of sample firms are aggregated into a single portfolio."

Buy-Sell Portfolios: We measure the performance of all stocks bought with a calendar-time "buy" portfolio. We measure the performance of all stocks sold with a calendar-time "sell" portfolio (that is distinct from the "buy" portfolio). If individuals have value-relevant information, stocks bought should go up by more than stocks sold. In addition, a strategy of mimicking the buying and selling behavior of individuals should outperform a strategy of pure indexing (i.e., the market). The return of the "buy" calendar-time portfolio on date t is the weighted average return of stocks currently held in the portfolio. Assume a one-year holding period. The portfolio on date t contains all stocks bought over the past year. Assume there are N_t such stocks in the portfolio on date t labeled $i_t = 1 \ldots N_t$. The weight of position i is the ratio of i's "position value" (measured as of date $t-1$) to the position value of all stocks in the portfolio (also measured on date $t-1$). When considering value-weighted calendar-time portfolios, stock i's position value when it enters the portfolio equals the total dollar amount purchased by individual investors in our dateset. The position value is then adjusted each day over the holding period by stock i's gross, daily stock return. The assumption of a one-year holding period is consistent with the average holding period for investors in our dataset—see Coval, Hirshleifer, and Shumway (2002).

Location-Based Portfolios: Because a goal of our paper is to evaluate the geographic / information content of trades, we also construct four different calendar-time/location portfolios: A) Local Buys; B) Local Sells; C) Remote Buys; and D) Remote Sells. Table 1, Panel C shows the number of transactions in each of the four portfolios by calendar year. Almost exactly one quarter of all transactions are categorized as local. There are between 134,946 and 192,279 total transactions in a given year.

We construct the four calendar-time/location portfolios in order to compare returns. For a one-year holding period the Local Buy portfolio contains all stocks bought by households, in which the distance between a given household and firm headquarters is less than or equal to 250 miles. The Local Sell portfolio contains all stocks sold by households in which the distance between a given household and firm headquarters is less than or equal to 250 miles. The Remote Buy portfolio contains all stocks bought by households, in which the distance between a given household and firm headquarters is more than 250 miles. The Remote Sell portfolio contains all stocks sold by households in which the distance between a given household and firm headquarters is more than 250 miles.[6]

Performance Evaluation: The strategies described above replicate one year buy-and-hold strategies of an investor who mimics household buying behavior. The returns of a calendar-time portfolio (or difference between two calendar-time portfolios) can be regressed against a constant, the market's excess return, or any other factors such as the Fama-French SMB and HML factors. All positions ($i = 1 \ldots N$) held on the same calendar date t are aggregated

[6]In Section 5.1 we consider equal-weighted calendar-time returns. In Sections 5.2 and 5.3 we allow for alternative specifications by defining local with a 100 mile radius and a 100 km radius.

into a single portfolio. Thus, cross-stock correlation is accounted for. Serial correlation and heteroscedasticity of residuals are handled by Newey-West standard errors. The regression equation is:

$$r_{port,t}^{A-B} = \alpha + \beta_m(r_{m,t} - r_{f,t}) + \gamma_1 SMB_t + \gamma_2 HML_t + \varepsilon_t \quad (2)$$

where $r_{port,t}^{A-B}$ is the difference between any two calendar-time portfolios (e.g, Buys minus Sells; Local Buys minus Local Sells; etc.) Equation 2 is extremely flexible in that it allows us to control for the possibility of individuals loading up on specific types of risk. For example, in Section 3.4 we test if individuals have information about smaller (non S&P 500) stocks. Such stocks presumably load significantly on the SMB factor and Equation 2 allows us to account for this loading. Other "factors" such as industry portfolios can easily be added.

3 Results

3.1 Calendar-Time/Buy-Sell Portfolios

Table 3 reports the performance of all stocks bought minus all stocks sold assuming a one-year holding period. In Regression 1, we see the stocks bought under-perform stocks sold by 0.87 basis points per day or 2.18% per annum. The under-performance is significant at all conventional levels. The regressions are based on 1,747 days of returns which represent the 1991 to 1996 data plus the final one year holding in 1997.

Table 3, Regressions 5 presents the full, risk-adjusted return to mimicking individual investors. The average daily under-performance is 0.55 basis points. The annual alpha is -1.38% and statistically less than zero at the 5%-level as can be seen by the -1.96 T-statistic. The calendar-time/buy-sell portfolio loads slightly negatively on the market and negatively on the HML factor. The magnitude of the under-performance is consistent with Table 2 in Odean (1999) while the factor loading differ slightly. A difference is that Odean (1999) uses an equal-weighted methodology and a monthly frequency in his portfolios.

In an absolute sense, individuals are poor at picking stocks. Stocks bought under-perform stocks sold. Market/risk adjusting does not change our findings. We now turn to testing if investors have relative performance differences within their portfolios. In other words, we ask if it is possible that local stock investments outperform remote stock investments.

3.2 Calendar-Time/Location Portfolios

Table 4 shows the average daily returns of our four calendar-time/location portfolios based on three different holding periods. The four portfolios are: A) Local Buys; B) Local Sells; C) Remote Buys; and D) Remote Sells. We consider one-, three-, and five-year holding periods. For most of this section, we focus on the one-year holding period returns. We report the average daily return and standard deviation for each of the four portfolios at the top of Table 4. More importantly, examining differences in calendar-time portfolio returns allows us to evaluate whether investors possess better information about local versus remote stocks.

We begin by asking: Do local stocks households buy outperform local stocks households sell? If individuals have value-relevant information about local stocks, they should be able to identify *undervalued* local stocks. After individuals buy local stocks, we should see the prices rise.[7] Individuals should also be able to identify *overvalued* local stocks. After individuals sell local stocks, we should see the prices fall. To answer our question we take the difference of the Local Buy portfolio (A) and the Local Sell portfolio (B). Surprisingly, the difference (A-B) has an annual return of -1.4121% based on a one-year holding period. The T-statistic is -1.43 indicating the average return is not statistically significant from zero. Throughout this paper we report T-statistics based on Newey-West standard errors. The standard errors are robust to heteroscedasticity and serial correlation. We use a five-day lag.[8] The -1.4121% return is important because the sign is opposite what earlier studies have found. Thus, increasing the amount of data would (most likely) increase the significance of this negative result.

The second questions we ask is: Do local stocks households buy outperform remote stocks households buy? This question follows naturally from the first question (above). If individuals do not have value-relevant information about remote stocks, they should not be able to identify undervalued remote stocks. After they buy remote stocks, we should not see the prices of remote stocks rise as the same rate as prices of recently purchased local stocks. To answer this question we take the difference of the Local Buy portfolio (A) and the Remote Buy portfolio (C). While the annual difference is positive (2.8453%) it is also not significantly different from zero at conventional levels.

[7] Because it is not clear how long it might take prices to adjust, we consider one-year, three-year, and five-year holding periods. These are the same holding periods considered in previous work.

[8] The Local Buy minus Local Sell portfolio is most easily compared with the methodology in Coval and Moskowitz (2001). The authors measure the return of all local stocks in which fund i increases its holdings. They also measure the return of all local stocks in which fund i decreases its holdings.

The third questions we ask is: Do local stocks households sell under-perform remote stocks households sell? In other words, are households better able to dump bad local stocks or bad remote stocks? To answer this question we take the difference of the Local Sell portfolio (B) and the Remote Sell portfolio (D). The annual difference is positive (1.9296%) and is not statistically significant. A positive difference is evidence against households having value-relevant information since the local stocks they sell actually *outperform* the remote stocks they sell.

The final questions we ask is: Does a Local Buy/Sell portfolio outperform a Remote Buy/Sell portfolio? To answer this question we take the difference of two differences. The Local Buy/Sell portfolio is (A-B). The Remote Buy/Sell portfolio is (C-D). The net difference in returns is only 0.8984% per annum and not statistically different from zero.

3.3 Risk-Adjusted Returns

In Table 5 we report risk-adjusted returns for two portfolios with one-year holding periods. Panel A shows results for the Local Buy minus Local Sell (or A-B) portfolio. Regression 1 reports the same average daily return (-0.000056) and T-statistic (-1.43) as previously shown in Table 4. Regression 5 presents coefficients and T-statistics using all factors shown in Equation 2. The risk-adjusted daily return is -0.000020 with a -0.50 T-statistic. Interestingly, the Local Buy minus Local Sell portfolio loads negatively and statistically significantly on the market. It also loads negatively on the HML portfolio. The loading on the market is not economically very significantly as the -0.0455 beta (β_m) indicates.

Table 5, Panel B shows results for the difference of difference portfolio—or (A-B)-(C-D). Regression 1 again reports the same average daily return (0.000036) and T-statistic (0.93) as previously shown in Table 4. Panel B, Regression 5 shows the risk-adjusted daily return to be 0.000043 and not significantly different from zero. No factor loadings are significant at conventional levels.

3.4 Non-S&P 500 stocks

Ivkovic and Weisbenner (2005) state that "excess returns to investing locally are even larger among stocks not in the S&P 500 index." The authors point out that non S&P 500 firms are those "for which information asymmetries between local and nonlocal investors may be largest." We test this hypothesis by analyzing trades of non-S&P 500 stocks.

Table 6 shows that there is no evidence of positive excess returns to investing locally in non-S&P 500 stocks. The Local Buy minus Local Sell portfolio (A-B) with a one-year holding period has a -1.5881% annualized return. The T-statistic of -1.15 indicates the return is not statistically different from zero. The Local Buy minus Remote Buy portfolio (A-C) based on a one-year holding period has a 2.9273% return with a 1.28 T-statistic. It is also not different from zero. The Local Buy/Sell portfolio minus the Remote Buy/Sell portfolio has a 1.4514% return with a 0.94 T-statistic.

We end this section by checking individuals' average performance when investing in small (non-S&P 500) stocks. We form two calendar-time portfolios much as we do in Table 3. The first portfolio mimics all buys of non-S&P 500 stocks. The second portfolio mimics all sales of non-S&P 500 stocks. Table 7 presents the results based on a one-year holding period.

Non-S&P 500 stocks bought under-perform non-S&P 500 stocks sold. The α is -0.000109 with a -3.00 T-statistic. The under-performance of individual trading in non-S&P 500 is greater than under-performance shown in Table 3, Regression 1. On a fully risk-adjusted basis, the under-performance with non-S&P 500 stocks is $\alpha = -0.000090$ with a -2.58 T-statistic. Individual investor under-performance is almost twice as large when considering only non-S&P 500 stocks than when considering all stocks (notice that α is -0.000055 in Table 3, Regression 5). The annualized, risk-adjusted under-performance is -2.25% for non-S&P 500 stocks and -1.38% for all stocks.

3.5 Summary of the Calendar-Time Portfolio Results

The results are very clear. There is no evidence that a household's local investments out-perform its remote investments. We have considered buys, sells, and differences of buys and sells. We have also considered non-S&P 500 stocks. A difference between our results and existing research is that we consider all trades made by individual investors in the dataset between 1991 and 1996. We show that local buys actually under-perform local sells with one year and five year holding periods. Our standard errors account for contemporaneous correlation across returns and are approximately six times larger than those previously reported.[9]

[9] The difference in standard errors can be seen with a back-of-the-envelope calculation. To be conservative, we use our most significant result for the one year holding period: in our Table 4, Local Buy minus Remote Buy has an annual difference of 2.8453% with a 1.73 T-statistic. These numbers imply a 1.64 standard error. Multiplying by $\sqrt{1747}$ gives a standard deviation of 68.55%. In order to compare with the one year results in Ivkovic and Weisbenner (2005), we

Given the discrepancies in results, we turn to investigating the sources of the differences more thoroughly.

4 Comparison with Ivkovic and Weisbenner (2005)

This section seeks to understand how two papers can reach different conclusions using the same dataset. We begin by investigating sample selection. We next consider methodology.

4.1 Comparison of Sample Properties

We identify the locality of 8,773 different CUSIPs. Ivkovic and Weisbenner (2005) report identifying the location of "5,478 stocks at the end of 1991." Because we identify more stocks, we can match these stocks with more households. The net result is 123 more households in our sample as of December 1991. The difference in samples is shown in Appendix 1, Panel A. We also compare reported values for average household portfolio value (Panel B) and average number of stocks in a household portfolio (Panel C). Difference in samples appear minimal.

4.2 Comparison of Methodologies

Ivkovic and Weisbenner suggest running the following cross-household regression (see Equation 4 of their paper):

$$R^i_{t,t+k} = \beta_L(\%L^i_t) + \beta_{NL}(\%NL^i_t) \tag{3}$$

Here, $R^i_{t,t+k}$ is household i's raw portfolio return over a k-year horizon. Specifically, they use monthly returns from January 1992 to December 1992 for a one-year horizon; from January 1992 to December 1994 for a three-year horizon; and from January 1992 to December 1996 for a five-year horizon. The right hand side variables $\%L^i_t$ and $\%NL^i_t$ are the fraction of household i's portfolio invested in local stocks and nonlocal (remote) stocks at the end of December 1991. The idea behind the regression has intuitive appeal: one wants to test if

divide the standard deviation by $\sqrt{252}$ to get the standard error associated with having only a year's worth of data. The implied standard error of 4.32% is approximately six times the 0.7% value report in Table V of their paper. Note, this calculation should not be taken too literally since the methodologies used in the two papers are different. It is, however, representative of problems that exist when stock returns are contemporaneously correlated.

portfolio choices predict future returns. In other words, do households that invest more locally have higher returns than those households that invest more remotely? To some, the regression initially appears strange due to the adding-up constraint ($\%L_t^i + \%NL_t^i \equiv 1.00$). However, it is important to realize there is no constant in (3) above. Therefore, the equation can be re-written in a form that makes calculating the statistical significance of a locality difference coefficient easy:

$$\begin{aligned} R_{t,t+k}^i &= \beta_L(\%L_t^i) + \beta_{NL}(\%NL_t^i) \\ &= \beta_L(\%L_t^i) + \beta_{NL}(1 - \%L_t^i) \\ &= \beta_L(\%L_t^i) + \beta_{NL} - \beta_{NL}(\%L_t^i) \\ &= \alpha + \beta_\Delta(\%L_t^i) \end{aligned} \tag{4}$$

The equation directly above makes the substitution $\alpha \equiv \beta_{NL}$ and $\beta_\Delta \equiv (\beta_L - \beta_{NL})$. The constant ($\alpha$) is just the average return on the remote stocks and the coefficient β_Δ is the locality difference. The locality difference coefficient can conveniently be interpreted in return units. A household that invests 100% locally has returns that are β_Δ percent *higher than* a household that invests 100% remotely (on average and if $\beta_\Delta \geq 0$). A household that invests 100% locally has returns that are β_Δ percent *less than* a household that invests 100% remotely (on average and if $\beta_\Delta \leq 0$).

In their paper, Ivkovic and Weisbenner (2005) report regression results with zip code fixed effects and standard errors that allow for heteroscedasticity. Their methodology does not correct for contemporaneous correlation. By inspection, T-statistics are overstated. To see this point, consider the following example:

> *Assume 30,000 investors independently decide to put a fraction X_i of their portfolio in Microsoft stock and $(1 - X_i)$ in General Motors stock. Assume the allocations decisions are truly independent, portfolio weights X_i where $(i = 1 \ldots 30,000)$ extend to many decimals places, and no two investors pick exactly the same allocation ($X_i \neq X_j$). We now track portfolio returns of each investor (r_i) over the next year. We run a regression of investor i's portfolio return on a constant and X_i. Even though we have 30,000 investors making 30,000 independent decisions, we only have two independent observations. In other words, any two allocations, $\{X_i, X_j\}$ with $X_i \neq X_j$ define a line. Once we know the return of both investor i's portfolio and investor j's portfolio, we know the return of any other investor k's portfolio for $k \neq i$ and $k \neq j$. Controlling for heteroscedasticity does nothing to fix the standard errors in this example—the 30,000 portfolio returns are correlated and the correlation must be accounted for.*

Table V of Ivkovic and Weisbenner (2005) reports 27,032 observations (households) and a correction for heteroscedasticity. However, investors in their sample only hold 3,000 to 4,000 different stocks which means returns over the first month consist of 4,000 independent observations (at most) and not the 27,032 observations reported. The authors try to correct for this problem by re-balancing the portfolios monthly. But re-balancing does not fix the problem for two reasons. After re-balancing, holdings at the end of October 1992 (say) are different from the original holdings at the end of December 1991. This means the November 1992 returns of investor i are not necessarily being generated by a portfolio with the same $\%L_t^i$ that existed in December 1991. Secondly, re-balancing does not address the fact that the true number of independent observations depends on the number of independent factors in the economy.

The calendar-time methodology forms daily portfolios of recently transacted stocks across all households. Thus, cross-stock correlation is accounted for when measuring the portfolio returns (because there is now only one time-series of returns).

4.3 Fragile Methodology

The Ivkovic and Weisbenner (2005) methodology is sensitive to sample definition criteria. In order to measure the difference between local and non-local returns at the household level, the authors impose two restrictions. First, they require households to hold $1,000 of stock as of December 31, 1991. Second, they require the household to have all twelve months of returns during 1992. We estimate that these two restrictions discard approximately 20% of available households.

Sensitivity to sample selection criteria comes from the fact the Equation 4 equal weights across households. The sample selection criteria imposed by Ivkovic and Weisbenner (2005) tends to affect small households. When using an equal-weighted methodology as they do, including or excluding just a few small households can generate large swings in their locality coefficient. We are able to generate 1992-locality coefficients ranging from 3.0% to 4.0% with small differences in sample selection criteria when using the Ivkovic and Weisbenner (2005) methodology.[10]

[10] In an effort to fully understand the effects of sample selection on the Ivkovic and Weisbenner (2005) locality coefficient, we have discussed our results with the authors. They have been very helpful in providing additional tables that were not included in the published version of their paper. We have requested, but thus far failed to obtain, their computer code and/or household sample.

5 Alternative Specifications

We test if our findings are robust to alternative specifications.

5.1 Equal-Weighted, Calendar-Time Portfolios

We re-visit the calendar-time portfolios but consider buying or selling the same dollar amount of each stock when mimicking the investment choices of individual investors. When a household buys a stock, our calendar-time portfolio buys one dollar of the same stock. When a household sells, our calendar-time portfolio sells one dollar of the same stock. The result is called an equal-weighted, calendar-time portfolio.

The results of the equal-weighted calendar-time portfolios are shown in Appendix 2 and can be compared with value-weighted results in Table 4. Overall, our conclusions are not changed. Interestingly, the Local Buy minus Local Sell portfolio has an annual return difference of -1.9713% with a -1.81 T-statistic. This result is marginally statistically significant and provides evidence that goes directly against informed investing. The difference-of-difference portfolio—(A-B)-(C-D)—has a very small annualized return of only 0.1479% with a 0.20 T-statistic.

Appendix 2 shows some statistical significance for the (A-C) and (B-D) portfolios using three-year and five-year holding periods. However, these differences cancel each other out. For example, households earn a statistically significant return of 2.9489% when comparing local buys to remote buys with a three-year holding period. Unfortunately, households earn a statistically significant return of 2.3208% when comparing local sells to remote sells with a three-year holding period. The second value, 2.3208%, is evidence *against* informed trading since local stocks households sell outperform the remote stocks households sell. The annual three-year difference-of-difference return, 0.6139%, makes this point clear.

5.2 100 mile Value-Weighted Portfolio Returns

Appendix 3 shows the results when local is defined as within a 100 mile radius. The value-weighted portfolios returns show no evidence of informed investing based on geography by individual investors.

5.3 100 km Value-Weighted Portfolio Returns

Appendix 4 shows the results when local is defined as within a 100 km radius. The value-weighted portfolios returns show no evidence of informed investing based on geography by individual investors. The use of a 100 km radius addresses concerns relating to our use of firm-county location. For those who prefer to compute the distance as one quarter of the distance between the centroid of the unit and the centroid of the nearest neighboring unit, the 100 km radius represents approximately one quarter of the 250 mile radius.

5.4 Different Time Periods

Appendix 5 five shows value-weighted, calendar-time portfolio returns broken down by calendar year. These returns are based on a 250 mile radius and from our difference-of-difference portfolio—(A-B)-(C-D). Because these calendar-time portfolios are based on a one-year holding period, the portfolio on June 15, 1995 (say) consists of any stock bought between June 15, 1994 and June 14, 1995. To be clear, the 1995 returns consist of stocks bought in both 1994 and 1995. Annual returns are 4.1665% in 1991 and 2.2680% in 1992. Local stock selection in 1991 is extraordinary and the portfolio at the end of 1991 contained these stocks. The Ivkovic and Weisbenner (2005) results consider portfolio holdings at the end of 1991.

5.5 Calendar-Time vs. Event-Time

Kumar (2004) uses the same dataset to estimate post-transaction returns of local and non-local stocks. Differences between our paper and his paper can be seen in the methodology and associated standard errors. Kumar (2004) uses event-time returns while we use calendar-time returns. He "lines up" both contemporaneous and non-contemporaneous events (in event-time) and treats observations as independent. Treating observations as independent undoubtedly leads to the high levels of reported significance.

It is interesting to note that, at first glance, the results in Kumar (2004) Table V, Panel A are similar to results in our Appendix 2. He reports a one year Local Buy minus Local Sell difference of -1.98% while we show a difference of -1.97% in Appendix 2. These number happen to be similar by pure chance. We compare his Table V, Panel B result of -1.93% for one year with our 100-mile, equal-weighted result of -1.61% (not reported). We find the results are different as expected. Note that our Appendix 3 reports a Local Buy minus Local

Sell difference of -1.19% using a *value-weighted* portfolio with a one-year holding period and a 100 mile radius.

5.6 Transactions vs. Holdings

The results in this paper are based on transactions. That is, we test if *actions* by individual investors reflect informed trading. We examine Local Buys, Local Sells, Remote Buys, and Remote Sells. We believe that arguments based on studying only buying behavior are misguided. Today's holdings are, by definition, the result of all past buys *and* all past sales. A study of the changes in holdings, by definition, is a study of net buys minus sells. Tables 4 and 6 present exactly these such results. We report the returns of a "local buy minus local sell" portfolio. We also report the returns of the "local buy/sell portfolio minus the remote buy/sell portfolio."

There is a deeper question about whether it is preferable to study transactions or holdings. We believe that studying transactions (not holdings) is the correct methodology when studying the term-structure, if any, of informed trading. Transactions allow the financial economist to exactly date purchases and sales of assets. Measuring post-transaction stock returns is accurate. Using holdings introduces uncertainty since it may not be clear how long a position has existed in an individual's portfolio. Statements about the term structure of information, if it exists, are therefore inexact at best.

5.7 Consistent and Robust Findings

Our results are robust and consistent across many specifications. Tables 4 and 6, and Appendices 2, 3, and 4 report 60 different tests for local information. Only five of the 60 return differences are significant at the 5% level—which is close to what one would expect by pure chance.

Oddly, any significance only appears with 3-yr and 5-yr holding periods buy not with 1-yr holding periods. Such a finding makes little economic sense but is entirely consistent with pure chance. Also, four of the significant return differences appear when considering equal-weighted, calendar-time portfolios (Appendix 2). Two of these four differences support the hypothesis of locals having information. Two of the four reject the same hypothesis. Most importantly, these four coefficients cancel each other out as can be seen in the difference of difference portfolio returns—(A-B)-(C-D)—at the bottom of Appendix 2.

Papers such as Ivkovic and Weisbenner (2005) effectively equal-weight returns by averaging across households. We we consider an equal-weighted calendar-time portfolio, we find that local buys under-perform local sells. The annualized under-performance of -1.9713% is marginally significant at the 7.0%-level.

6 Conclusions

This paper examines the geographic/information content of individual investors' portfolio choices. We use calendar-time portfolios based on transaction-level data. We begin by studying all buys and all sales by investors in our dataset. On average, individuals appear poor at selecting stocks. Stocks bought under-perform stocks sold by 2.18% per annum (1.38% on a risk-adjusted basis). This first result is important because it highlights the ability of the calendar-time portfolios to detect performance differences in our dataset.

We next test for relative return differences between different types of individual transactions. This paper focuses on local and remote stocks and shows there is no evidence of informed investing by individuals. Local stocks bought by individual investors do not outperform local stocks sold by individuals. Local stocks sold do not go down more than (do not perform relatively worse than) remote stocks sold. Our results are robust to one-, three-, and five-year holding periods; equal- and value-weighted portfolio formation methods; different calendar years; and the consideration of non S&P 500 stocks.

Our results are starkly different from those in Ivkovic and Weisbenner (2005). Because the two papers use the same dataset, we investigate the source behind the different results. Our calendar-time portfolios consider *all* transactions during between 1991 and 1996. Differences also stem from properly accounting for correlation across individual portfolio returns. Forming portfolios effectively deals with contemporaneous correlation across stocks.

6.1 Implications for Home Bias Research

Our results show that living near a company does not endow an investor with value-relevant information. Individual investors heavily over-weight local stocks. But, local stocks bought by individual investors do not outperform local stocks sold by individuals. We present statistically significant results that stocks individuals buy under-perform stocks they sell on average. Since the degree of this under-performance has no link to geography, we believe it is fair to inquire about possible directions for future research on informed/geographical investing by individuals. We can think of four specific areas:

a) Investor Specific Characteristics: It is possible that sorting by investor characteristics and location will uncover evidence of informed/geographical investing. Wealthy investors or high-trading volume investors who live near companies may outperform other investor/location combinations. It is possible that living in a big city or near a financial center provides individuals with valuable information—though Hau (2001) finds that living near a financial center offers no advantage for professional traders in Frankfurt.

b) Stock Specific Characteristics: It is possible that individual investors have value-relevant information about certain local companies. Existing research points to small, highly levered companies as possible candidates. Individuals might have value-relevant information about companies with local distribution networks as opposed to national distribution networks. This line of research is unlikely to be fruitful since we show in this paper that local investments in non-S&P 500 stocks do not out-perform remote investments in non-S&P 500 stocks. In fact, individual investor under-performance is almost twice as large when considering non-S&P 500 stocks than when considering all stocks.

c) Short Horizons: It is possible that investors have short-lived information. Using calendar-time portfolios, one can study holding periods of a month, a week, or just a few days. Event-time results in Kumar (2004) are suggestive that such a possibility should be investigated. At short holding periods (a week or less) problems associated with correlated portfolio returns are reduced, but not eliminated (this makes interpreting some of Kumar's results easier). The shorter the holding period, the more micro-structure effects need to be accounted for. While short-horizon returns are a potentially an interesting research avenue, there are pitfalls. Kaniel, Saar, and Titman (2004) show that stocks individual investor buy earn a profit for up to a month. However, the authors do not attribute their findings to informed trading. Instead Kaniel, Saar, and Titman (2004) conclude that individual investors are being compensated (in the short-term) for providing liquidity to institutional investors. Thus, any study or short horizon informed trading must deal with both micro-structure effects and separating the information story from a liquidity provision story.

d) Lack of Competition From Local Mutual Funds: Probably the most interesting direction for future research is a study competition in the market for information. Regions of the country with few or no professional managers may present opportunities for individual investors to invest in local companies. Regions of the country with many professional managers presumably have few opportunities for individual investors. Such a study requires combining data used by Coval and Moskowitz (2001) with individual investor data.

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Table 1
Summary Statistics

This table provides overview statistics of our data. Investor data come from a large, discount brokerage house. Household locality is based on each household's zip code. We exclude households located outside the continental United States. We consider only common stocks listed on NYSE, AMEX, and Nasdaq exchanges. Only stocks that can be matched with CRSP and Compustat are included. Firm-locality information is based on the reported county and state of the headquarters as reported by Compustat. Local stocks are defined as being headquartered within a 250 mile radius of a household. Remote stocks are defined as being headquartered outside the 250 mile radius.

Panel A: Number of Households

i.	Households	77,795
ii.	Households from (i) with Locality Information	54,538
iii.	Households from (ii) in Continental United States	53,443
iv.	Households from (iii) with at Least One Common Stock Holding During Our Sample Period	44,836
v.	Households from (iv) with at Least One Common Stock Holding with Firm-Locality Information	43,132

Panel B: Household Transactions

All Buys	All Sells	Total
534,345	448,977	983,322

Panel C: Household-Locality Transactions

Year	Local Buys	Local Sells	Remote Buys	Remote Sells	Annual Total
1991	23,276	17,764	68,888	50,670	**160,598**
1992	22,761	17,708	66,201	50,501	**157,171**
1993	21,619	19,180	63,172	55,997	**159,968**
1994	18,647	16,182	53,621	46,496	**134,946**
1995	23,518	22,348	69,750	62,744	**178,360**
1996	24,945	21,607	77,947	67,780	**192,279**
Total	**134,766**	**114,789**	**399,579**	**334,188**	**983,322**

Table 2
Local Bias in Holdings

This table shows the degree to which households overweight local stocks. For each household, we calculate the fraction of the portfolio within a radius of 100 km, 100 miles, and 250 miles. Distance is measured from the households zip code to the zip code of the firm's headquarters. For each household, we also calculate the fraction of the market (all stocks) within the same radii. The difference between these two measures represents the measure of local bias.

Panel A: Local Bias Based on 100 km Radius

Portfolio	% of Port.	% of Market	Local Bias Measures		
Date	≤100 km	≤100 km	Diff.	Ratio	ln(Ratio)
Dec-1991	19.8	5.7	14.1	3.5	1.2
1992	19.0	5.6	13.4	3.4	1.2
1993	19.7	5.5	14.2	3.6	1.3
1994	19.5	5.6	13.9	3.5	1.2
1995	19.9	5.5	14.4	3.6	1.3

Panel B: Local Bias Based on 100 mile Radius

Portfolio	% of Port.	% of Market	Local Bias Measures		
Date	≤100 km	≤100 km	Diff.	Ratio	ln(Ratio)
Dec-1991	22.4	7.1	15.3	3.2	1.1
1992	21.6	6.9	14.7	3.1	1.1
1993	22.4	6.8	15.6	3.3	1.2
1994	22.0	7.0	15.0	3.1	1.1
1995	22.4	6.9	15.5	3.2	1.2

Panel A: Local Bias Based on 250 mile Radius

Portfolio	% of Port.	% of Market	Local Bias Measures		
Date	≤100 km	≤100 km	Diff.	Ratio	ln(Ratio)
Dec-1991	30.3	12.6	17.7	2.4	0.9
1992	29.3	12.1	17.2	2.4	0.9
1993	30.2	11.8	18.4	2.6	0.9
1994	29.1	12.0	17.1	2.4	0.9
1995	30.2	12.0	18.2	2.5	0.9

Table 3
Risk-Adjusted Calendar-Time Portfolio Returns

This table reports the risk-adjusted returns of a Buy minus Sell calendar-time portfolio. The Buy portfolio and the Sell portfolio are formed by mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Positions are held for one year. T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

$$r_{port,t}^{Buy-Sell} = \alpha + \beta_m \left(r_{m,t} - r_{f,t} \right) + \gamma_1 SMB_t + \gamma_2 HML_t + \varepsilon_t$$

	Reg. 1	**Reg. 2**	**Reg. 3**	**Reg. 4**	**Reg. 5**
α	-0.000087	-0.000081	-0.000089	-0.000079	-0.000055
T-stat	*(-2.97)*	*(-2.78)*	*(-3.11)*	*(-2.73)*	*(-1.96)*
β_m		-0.0105			-0.0330
T-stat		*(-1.49)*			*(-4.89)*
γ_1			0.0314		0.0064
T-stat			*(4.49)*		*(0.84)*
γ_2				-0.0473	-0.0775
T-stat				*(-3.84)*	*(-6.62)*
Annual α	-2.18%	-2.03%	-2.21%	-1.96%	-1.38%

Table 4
Calendar-Time/Location Portfolio Returns

This table reports the calendar-time returns of four different portfolios: A) Local Buys; B) Local Sells; C) Remote buys; and D) Remote Sells. Portfolios are formed by mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Locality is defined by a 250 mile radius. Positions are held for either one year (252 days), three years (756 days), or five years (1,260 days.) T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

A: Local Buy Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000861	0.001136	0.000854
Std. Dev.	0.011673	0.013374	0.017010
N	1747	2249	2752

B: Local Sell Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000917	0.001127	0.000875
Std. Dev.	0.011742	0.013293	0.016858
N	1747	2249	2752

C: Remote Buy Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000750	0.001007	0.000781
Std. Dev.	0.010495	0.012138	0.015186
N	1747	2249	2752

D: Remote Sell Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000841	0.001040	0.000812
Std. Dev.	0.010357	0.011939	0.014908
N	1747	2249	2752

		Holding Period		
		1-Yr	**3-Yr**	**5-Yr**
Local Buy – Local Sell	Daily Diff.	-0.000056	0.000009	-0.000021
(or A – B)	N (Days)	1747	2249	2752
	Annual Diff.	-1.4121%	0.2319%	-0.5372%
	T-Stat	-1.43	0.28	-0.69
Local Buy – Remote Buy	Daily Diff.	0.000111	0.000129	0.000073
(or A – C)	N (Days)	1747	2249	2752
	Annual Diff.	2.8453%	3.3015%	1.8483%
	T-Stat	1.73	2.35	1.20
Local Sell – Remote Sell	Daily Diff.	0.000076	0.000087	0.000064
(or B – D)	N (Days)	1747	2249	2752
	Annual Diff.	1.9296%	2.2161%	1.6197%
	T-Stat	1.16	1.43	1.00
Local Buy/Sell Portfolio	Daily Diff.	0.000036	0.000042	0.000009
– Remote Buy/Sell Portfolio	N (Days)	1747	2249	2752
(or {A–B} – {C–D})	Annual Diff.	0.8984%	1.0619%	0.2249%
	T-Stat	0.93	1.39	0.35

Table 5
Risk-Adjusted Calendar-Time/Location Portfolio Returns

This table reports the risk-adjusted returns of two different calendar-time portfolios. Panel A shows the Local Buy minus Local Sells portfolio (labeled "A-B" in the text and Table 4.) Panel B shows the Local Buy/Sell minus Remote Buy/Sell portfolio (labeled {A-B} – {C-D} in the text and Table 4.) Portfolios are formed by mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Positions are held for one year. T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

$$r_{port,t}^{A-B} = \alpha + \beta_m \left(r_{m,t} - r_{f,t} \right) + \gamma_1 SMB_t + \gamma_2 HML_t + \varepsilon_t$$

Panel A: Local Buy – Local Sell

	Reg. 1	**Reg. 2**	**Reg. 3**	**Reg. 4**	**Reg. 5**
α	-0.000056	-0.000043	-0.000058	-0.000053	-0.000020
T-stat	*(-1.43)*	*(-1.04)*	*(-1.48)*	*(-1.36)*	*(-0.50)*
β_m		-0.0250			-0.0455
T-stat		*(-2.62)*			*(-3.98)*
γ_1			0.0264		-0.0053
T-stat			*(2.31)*		*(-0.41)*
γ_2				-0.0188	-0.0615
T-stat				*(-1.23)*	*(-3.53)*

Panel B: Local Buy/Sell Portfolio – Remote Buy/Sell Portfolio

	Reg. 1	**Reg. 2**	**Reg. 3**	**Reg. 4**	**Reg. 5**
α	0.000036	0.000047	0.000036	0.000028	0.000043
T-stat	*(0.93)*	*(1.19)*	*(0.94)*	*(0.76)*	*(1.13)*
β_m		-0.0216			-0.0196
T-stat		*(-2.08)*			*(-1.74)*
γ_1			-0.0085		-0.0192
T-stat			*(-0.75)*		*(-1.45)*
γ_2				0.0418	0.0222
T-stat				*(2.43)*	*(1.27)*

Table 6
Calendar-Time/Location Portfolio Returns: Non S&P 500 Stocks

This table reports the calendar-time returns of four different portfolios: A) Local Buys; B) Local Sells; C) Remote buys; and D) Remote Sells. Portfolios are formed based on mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Positions are held for either one year (252 days), three years (756 days), or five days (1,260 days.) T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

A: Local Buy Portfolio

	1 Yr	3 Yr	5 Yr
Avg. Daily Return	0.000851	0.001184	0.000918
Std. Dev.	0.013150	0.015370	0.018920
N	1747	2249	2752

B: Local Sell Portfolio

	1 Yr	3 Yr	5 Yr
Avg. Daily Return	0.000914	0.001193	0.000958
Std. Dev.	0.013468	0.015374	0.019277
N	1747	2249	2752

C: Remote Buy Portfolio

	1 Yr	3 Yr	5 Yr
Avg. Daily Return	0.000736	0.001057	0.000839
Std. Dev.	0.012195	0.014343	0.017639
N	1747	2249	2752

D: Remote Sell Portfolio

	1 Yr	3 Yr	5 Yr
Avg. Daily Return	0.000857	0.001131	0.000905
Std. Dev.	0.012383	0.014324	0.018072
N	1747	2249	2752

		Holding Period		
		1-Yr	**3-Yr**	**5-Yr**
Local Buy – Local Sell (or A – B)	Daily Diff.	-0.000064	-0.000009	-0.000040
	N (Days)	1747	2249	2752
	Annual Diff.	-1.5881%	-0.2214%	-1.0048%
	T-Stat	-1.15	-0.17	-0.79
Local Buy – Remote Buy (or A – C)	Daily Diff.	0.000115	0.000127	0.000080
	N (Days)	1747	2249	2752
	Annual Diff.	2.9273%	3.2567%	2.0257%
	T-Stat	1.28	1.73	0.98
Local Sell – Remote Sell (or B – D)	Daily Diff.	0.000057	0.000062	0.000053
	N (Days)	1747	2249	2752
	Annual Diff.	1.4549%	1.5639%	1.3513%
	T-Stat	0.66	0.78	0.63
Local Buy/Sell Portfolio – Remote Buy/Sell Portfolio (or {A–B} – {C–D})	Daily Diff.	0.000057	0.000066	0.000026
	N (Days)	1747	2249	2752
	Annual Diff.	1.4514%	1.6669%	0.6654%
	T-Stat	0.94	1.30	0.60

Table 7
Risk-Adjusted Calendar-Time Portfolio Returns
Non S&P 500 Stocks

This table reports the risk-adjusted returns of a Buy minus Sell calendar-time portfolio using only non S&P 500 stocks. The Buy portfolio and the Sell portfolio are formed by mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Positions are held for one year. T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

$$r_{port,t}^{Buy-Sell(non-S\&P500)} = \alpha + \beta_m \left(r_{m,t} - r_{f,t}\right) + \gamma_1 SMB_t + \gamma_2 HML_t + \varepsilon_t$$

	Reg. 1	**Reg. 2**	**Reg. 3**	**Reg. 4**	**Reg. 5**
α	-0.000109	-0.000094	-0.000111	-0.000111	-0.000090
T-stat	*(-3.00)*	*(-2.66)*	*(-3.10)*	*(-2.97)*	*(-2.58)*
β_m		-0.0283			-0.0296
T-stat		*(-2.71)*			*(-3.19)*
γ_1			0.0369		0.0176
T-stat			*(3.65)*		*(1.93)*
γ_2				0.0077	-0.0185
T-stat				*(0.49)*	*(-1.46)*
Annual α	-2.72%	-2.33%	-2.76%	-2.75%	-2.25%

Appendix 1
Comparison Statistics

This shows summary statistics from households that hold at least $1,000 of common stocks in their portfolios. We consider only common stocks listed on NYSE, AMEX, and Nasdaq exchanges. Only stock that can be matched with CRSP and Compustat are included. We exclude households located outside the continental United States.

Panel A: Number of Households

	Ivkovic and Weisbenner (2005)		Our Paper	
Portfolio Date	**Initial Number**	**Over Next 12 months**	**Initial Number**	**Over Next 12 months**
Dec-1991	34,517	27,032	34,640	27,117
1992	n.a.	n.a.	35,260	24,432
1993	n.a.	n.a.	30,005	18,209
1994	n.a.	n.a.	21,794	14,390
1995	n.a.	n.a.	17,272	12,128

Panel B: Value of Average Household Stock Portfolio

Portfolio Date	Ivkovic and Weisbenner (2005)	Our Paper
Dec-1991	$ 32,911	$ 35,162
1992	n.a.	41,738
1993	n.a.	46,893
1994	n.a.	47,906
1995	n.a.	65,737

Panel C: Average Number of Stocks in a Household Portfolio

Portfolio Date	Ivkovic and Weisbenner (2005)	Our Paper
Dec-1991	3.3	3.4
1992	n.a.	3.9
1993	n.a.	4.3
1994	n.a.	4.5
1995	n.a.	4.8

Appendix 2
Calendar-Time/Location Portfolio Returns: Equal-Weighting

This table reports the calendar-time returns of four different portfolios: A) Local Buys; B) Local Sells; C) Remote buys; and D) Remote Sells. Portfolios are formed based on mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Positions are held for either one year (252 days), three years (756 days), or five years (1,260 days.) T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

A: Local Buy Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000798	0.001067	0.000816
Std. Dev.	0.010364	0.012266	0.015767
N	1747	2249	2752

B: Local Sell Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000877	0.001070	0.000839
Std. Dev.	0.010218	0.011869	0.015220
N	1747	2249	2752

C: Remote Buy Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000730	0.000951	0.000729
Std. Dev.	0.009721	0.011361	0.014378
N	1747	2249	2752

D: Remote Sell Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000815	0.000979	0.000747
Std. Dev.	0.009404	0.010949	0.013756
N	1747	2249	2752

		Holding Period		
		1-Yr	**3-Yr**	**5-Yr**
Local Buy – Local Sell	Daily Diff.	-0.000079	-0.000004	-0.000023
(or A – B)	N (Days)	1747	2249	2752
	Annual Diff.	-1.9713%	-0.0990%	-0.5689%
	T-Stat	-1.81	-0.10	-0.71
Local Buy – Remote Buy	Daily Diff.	0.000068	0.000115	0.000087
(or A – C)	N (Days)	1747	2249	2752
	Annual Diff.	1.7188%	2.9489%	2.2099%
	T-Stat	1.54	3.04	2.13
Local Sell – Remote Sell	Daily Diff.	0.000062	0.000091	0.000091
(or B – D)	N (Days)	1747	2249	2752
	Annual Diff.	1.5685%	2.3208%	2.3277%
	T-Stat	1.37	2.28	2.14
Local Buy/Sell Portfolio	Daily Diff.	0.000006	0.000024	-0.000005
– Remote Buy/Sell Portfolio	N (Days)	1747	2249	2752
(or {A–B} – {C–D})	Annual Diff.	0.1479%	0.6139%	-0.1151%
	T-Stat	0.20	0.99	-0.22

Appendix 3
Calendar-Time/Location Portfolio Returns: 100 mile Radius

This table reports the calendar-time returns of four different portfolios: A) Local Buys; B) Local Sells; C) Remote buys; and D) Remote Sells. Portfolios are formed based on mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Positions are held for either one year (252 days), three years (756 days), or five years (1,260 days.) T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

A: Local Buy Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000867	0.001136	0.000879
Std. Dev.	0.012613	0.014008	0.018031
N	1747	2249	2752

B: Local Sell Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000915	0.001136	0.000894
Std. Dev.	0.012599	0.013938	0.017680
N	1747	2249	2752

C: Remote Buy Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000759	0.001020	0.000784
Std. Dev.	0.010377	0.012128	0.015124
N	1747	2249	2752

D: Remote Sell Portfolio

	1 Yr	**3 Yr**	**5 Yr**
Avg. Daily Return	0.000849	0.001048	0.000813
Std. Dev.	0.010268	0.011913	0.014884
N	1747	2249	2752

		Holding Period		
		1-Yr	**3-Yr**	**5-Yr**
Local Buy – Local Sell	Daily Diff.	-0.000048	0.000000	-0.000015
(or A – B)	N (Days)	1747	2249	2752
	Annual Diff.	-1.1902%	0.0007%	-0.3797%
	T-Stat	-1.05	0.00	-0.41
Local Buy – Remote Buy	Daily Diff.	0.000108	0.000116	0.000094
(or A – C)	N (Days)	1747	2249	2752
	Annual Diff.	2.7553%	2.9555%	2.4059%
	T-Stat	1.13	1.36	1.04
Local Sell – Remote Sell	Daily Diff.	0.000065	0.000088	0.000081
(or B – D)	N (Days)	1747	2249	2752
	Annual Diff.	1.6610%	2.2404%	2.0524%
	T-Stat	0.68	1.04	0.92
Local Buy/Sell Portfolio	Daily Diff.	0.000042	0.000028	0.000014
– Remote Buy/Sell Portfolio	N (Days)	1747	2249	2752
(or {A–B} – {C–D})	Annual Diff.	1.0766%	0.6995%	0.3465%
	T-Stat	0.94	0.70	0.43

Appendix 4
Calendar-Time/Location Portfolio Returns: 100 kilometer Radius

This table reports the calendar-time returns of four different portfolios: A) Local Buys; B) Local Sells; C) Remote buys; and D) Remote Sells. Portfolios are formed based on mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Positions are held for either one year (252 days), three years (756 days), or five years (1,260 days.) T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

A: Local Buy Portfolio

	1 Yr	3 Yr	5 Yr
Avg. Daily Return	0.000886	0.001148	0.000899
Std. Dev.	0.012898	0.014225	0.018202
N	1747	2249	2752

B: Local Sell Portfolio

	1 Yr	3 Yr	5 Yr
Avg. Daily Return	0.000925	0.001142	0.000909
Std. Dev.	0.012890	0.014169	0.017931
N	1747	2249	2752

C: Remote Buy Portfolio

	1 Yr	3 Yr	5 Yr
Avg. Daily Return	0.000758	0.001021	0.000783
Std. Dev.	0.010375	0.012131	0.015166
N	1747	2249	2752

D: Remote Sell Portfolio

	1 Yr	3 Yr	5 Yr
Avg. Daily Return	0.000848	0.001048	0.000811
Std. Dev.	0.010262	0.011915	0.014901
N	1747	2249	2752

		Holding Period		
		1-Yr	**3-Yr**	**5-Yr**
Local Buy – Local Sell	Daily Diff.	-0.000039	0.000005	-0.000010
(or A – B)	N (Days)	1747	2249	2752
	Annual Diff.	-0.9818%	0.1364%	-0.2406%
	T-Stat	-0.82	0.13	-0.25
Local Buy – Remote Buy	Daily Diff.	0.000127	0.000126	0.000117
(or A – C)	N (Days)	1747	2249	2752
	Annual Diff.	3.2585%	3.2358%	2.9877%
	T-Stat	1.23	1.37	1.22
Local Sell – Remote Sell	Daily Diff.	0.000077	0.000094	0.000098
(or B – D)	N (Days)	1747	2249	2752
	Annual Diff.	1.9595%	2.4046%	2.4887%
	T-Stat	0.73	1.02	1.05
Local Buy/Sell Portfolio	Daily Diff.	0.000050	0.000032	0.000019
– Remote Buy/Sell Portfolio	N (Days)	1747	2249	2752
(or {A–B} – {C–D})	Annual Diff.	1.2741%	0.8118%	0.4869%
	T-Stat	1.03	0.76	0.57

Appendix 5
Calendar-Time/Location Returns, By Year

This table reports the calendar-time returns, by year, for the difference-in-difference portfolio: Local Buy/Sell – Remote Buy/Sell or ({A-B} – {C-D}). Portfolios are formed based on mimicking the trades of all investors in our sample between January 1, 1991 and November 30, 1996. Positions are held for one year which we define as 252 days. T-statistics are based on Newey-West standard errors and correct for heteroscedasticity and serial correlation of residuals.

	Average Daily Return	**Annual Return**	**T-stat**
1991	0.000162	4.1665 %	1.14
1992	0.000089	2.2680	1.82
1993	0.000045	1.1404	0.74
1994	-0.000078	-1.9465	-1.54
1995	0.000083	2.1135	1.27
1996	-0.000048	-1.2023	-0.32

Appendix 6
Comparison with Massa and Simonov (2004)

Massa and Simonov (2004) study household portfolio choice in Sweden. The authors report "an increase in the proximity to the stock by a factor of ten (i.e., a move from 100 km to 10 km) increases financial profits by 5.80% for the overall sample." We do not have access to the data and, therefore, cannot explore this finding in detail. We proceed with hesitation and note certain similarities between the methodology used in Massa and Simonov (2004) and the methodology used in Ivkovic and Weisbenner (2005).

The Massa and Simonov (2004) dataset has 292,901 households per year (on average) over a six year time period (1995-2000). This gives 1,757,406 household-year observations. Not all households choose to enter the stock market. The authors address this choice with a two-step estimation procedure.

Massa and Simonov (2004) construct a measure of financial profit for each household, each year. They regress financial profits on demographic variables—which include a measure of geographical proximity. The data are annual and there are about 300 listed stocks in Sweden. Given six years of data and the small number of stocks, there is a worry that cross-sectional dependence reduces the number of independent observations. The number of households is much larger than the number of securities in Sweden. The number of households is also much larger than the number time periods (years) *multiplied* by the number of securities. Since the authors did not form portfolios, it is unclear how contemporaneous cross-sectional correlation of stock returns is accounted for.