Investor Competence, Trading Frequency, and Home Bias

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Abstract

People are more willing to bet on their own judgments when they feel skillful or knowledgeable (Heath and Tversky (1991)). We investigate whether this "competence effect" influences trading frequency and home bias. We find that investors who feel competent trade more often and have a more internationally diversified portfolio. We also find that male investors, and investors with higher income or more education, are more likely to perceive themselves as knowledgeable investors than are female investors, and investors with lower income or less education. Our results are unlikely to be explained by other hypotheses, such as overconfidence or informational advantage.

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I. Introduction

Traditional portfolio choice theories assume that investors maximize expected utility based on their beliefs of future asset returns and asset comovements. However, forming beliefs about the future distribution of asset returns is difficult. Every day, an enormous amount of new information arrives. The implications of the new information about future asset returns are highly uncertain and difficult to decipher. Thus, an investor's subjective probability distribution of future asset returns is ambiguous, i.e., the *probability distribution* itself is uncertain. This uncertainty is different from the traditional concept of risk, in which the probability distribution of asset returns is known to the investor.

A large literature in psychology has studied behavior when the probability distribution of the outcome of a lottery is ambiguous (Camerer and Weber (1992)). Ellsberg (1961) identifies the concept of ambiguity aversion, which occurs when people prefer to bet on lotteries with known probabilities of winning, rather than lotteries with ambiguous outcome distributions. Heath and Tversky (1991) identify a related concept, the competence effect, which posits that ambiguity aversion is affected by the subjective competence level of participants. When people feel skillful or knowledgeable in an area, they would rather bet on their own judgment (even though it is ambiguous) than on an equiprobable chance event (e.g., drawing balls from an urn with known contents), even though the outcome of the chance event has an unambiguous probability distribution. However, when participants do not feel competent, they prefer to bet on the unambiguous chance event. Therefore, the effects of ambiguity aversion are conditional on the subjective competence level of participants.

The competence effect is best illustrated using an example (from Heath and Tversky (1991)). In their experiment, a participant answers a set of knowledge questions concerning history, geography, or sports. For each question, the participant is asked to report his or her confidence in the answer, i.e., the subjective probability that his or her given answer is correct. Finally the participant is presented with two choices, either to bet on his or her own answer, or to bet on a lottery in which the probability of winning is the same as the stated confidence. Heath and Tversky find that when people feel very knowledgeable about the subject matter (i.e., they feel "competent"), they are more likely to bet on their own judgments rather than the matched-chance lottery. When people feel less knowledgeable, however, they tend to choose the matched-chance lottery.

The competence effect is particularly relevant to understand investor behavior. In financial markets, investors are constantly required to make decisions based on ambiguous, subjective

probabilities. It is likely that their educational background and other demographic characteristics make some investors feel more competent than others in understanding the array of financial information and opportunities available to them. In the first part of this paper, we explore the relation between investor characteristics and competence. In most behavioral finance research, the underlying psychological bias is not observed directly, and therefore, these studies have to proxy for the bias. A well-known example is found in Barber and Odean (2001), where gender is used as a proxy for degree of overconfidence. Ours is among the few papers that directly measure the underlying psychological bias. In our paper, investor competence is measured through survey responses. This allows us to empirically model competence as determined by a set of investor characteristics, e.g., gender, education, age, and income. We find that male investors, and investors with higher income and more education, are more likely to believe they are competent investors than are female investors, and those with less income and education.

We also study the link between competence and investor behavior. Most empirical behavioral finance research studies one psychological bias to explain one type of investor behavior. While these studies provide important insights, they do not directly compare which biases are relatively more important in affecting investor behavior. Second, and related to the first, if a psychological bias is deeply ingrained, it should affect multiple aspects of investor decision-making. Our paper takes a first step towards addressing these issues. We study two types of investor behavior, namely trading frequency and home bias. Although there exists extensive literatures on both trading frequency and home bias, these two have always been treated separately. In this paper, we argue that these two aspects of behavior are driven (at least in part) by the same underlying psychological bias, namely, the competence effect.

With regard to trading frequency, we hypothesize that investors who feel more competent tend to trade more frequently than investors who feel less competent. This occurs because investors who feel more knowledgeable in making financial decisions should be more willing to act on their judgments (Heath and Tversky 1991). Our empirical results are consistent with this hypothesis.

We argue that the competence effect also contributes to home bias. (Home bias refers to the tendency to overweight domestic equities and underweight international equities in investment portfolios (see, e.g., French and Porteba 1991).) When an investor feels that he fully understands the benefits and risks involved in investing in foreign assets, he is more willing to invest in foreign securities. In contrast, when an investor feels less competent, he is more likely

to avoid foreign assets. Consistent with these predictions, our results suggest that investors with more competence are more likely to invest in international assets.

The rest of the paper is organized as follows. Section II reviews related literature and develops our hypotheses in more detail. Section III discusses the data. Section IV presents the empirical analysis. Some concluding remarks are offered in the final section.

II. Theory and Hypotheses

A. Ambiguity Aversion and the Competence Effect

The classic example of ambiguity aversion is found in Ellsberg (1961). Consider two urns, one contains 50 red balls and 50 black balls, and the other containing 100 balls in unknown combination of red and black. A participant can choose to draw one ball from either urn, and guess its color. The participant receives a positive payoff if and only if he guesses correctly. Ellsberg finds that people would rather bet on the first urn (the known probability event) than on the second urn (the ambiguous event).

In the Ellsberg setting, participants are asked to choose between two chance events, with no subjectivity involved. In financial markets, however, investors make decisions based on subjective probabilities. For example, they have to determine the probability of IBM's stock price decreasing by at least $1 if the Fed raises interest rates by 25 basis points. Does ambiguity aversion hold under subjective probabilities? According to Heath and Tversky (1991), the answer to this question depends on the investor's subjective competence level. When people feel skillful or knowledgeable, they prefer to bet on their own judgment (an ambiguous event) versus betting on an equiprobable chance event (a known probability event). In contrast, when they do not feel skillful or knowledgeable, they prefer the chance event.

The competence effect is best illustrated with an experiment. Participants first report their subjective knowledge level about the game of football. Next, they are asked to predict the winner of a football game and also report their subjective probabilities of the predictions being correct. Then they are asked to choose between two bets, either to bet on their own judgment, or a lottery that provides an equal chance of winning. In this example, subjective competence is captured in two dimensions: the self-rated knowledge level, and the subjective probability of the football prediction being correct. The results of this experiment are shown in Figure 1 (adapted from Heath and Tversky (1991), Figure 4). The percentage of participants choosing to bet on their own judgments increases with both measures of subjective competence. When subjects feel that they

are highly competent in predicting the results of football games, they prefer to bet on their own judgment. In fact, even when presented with a lottery with a greater chance of winning, they would still prefer to bet on their football predictions. In other words, they are willing to pay a premium to bet on their own judgments. When people do not feel competent, however, the matching chance lottery is preferred.

In the long-established economic tradition of expected utility theory, only the probability distribution of the payoff matters; the confidence that the agent has over this distribution is irrelevant. In other words, preferences and probability distributions are assumed to be independent of each other. The psychology literature cited above offers evidence to the contrary. People are more willing to act on their judgments when they feel more competent in the area. In other words, beliefs and preferences are no longer independent, they are entangled.[1]

In financial markets, not all investors feel equally competent in making investment decisions. In general, an investor with a high school education and annual income of less than $25,000 may feel less competent as an investor relative to a highly-educated investor with a much higher income. It is worthwhile emphasizing that competence is a self-perceived skill or knowledge, not necessarily the true level of skill or information an investor has. For example, an advanced degree might make a person feel smart and insightful, and such a person might therefore feel competent towards many things in general, including making financial decisions. Similarly, a person with higher income may feel more successful and more powerful in daily life. This feeling can carry over to the domain of financial decision-making.

There is an avenue for overconfidence to affect investment decisions within the competence theory (in addition to overconfidence potentially having an independent effect). Within the context of the betting example mentioned above, consider a bettor who successfully picks winners 65 percent of the time. The competence effect states that the bettor would prefer to bet on his football picks versus being rewarded for selecting a red ball from an urn with 65 out of 100 red balls. Overconfidence can inflate an investor's subjective probabilities, which accentuates the competence effect. For example, overconfidence might inflate the investor's subjective

[1] See review papers by see Shoemaker (1982), Camerer (1995), and Stramer (2000) for summaries of other challenges to expected utility theory and new types of preferences have been proposed in light of these challenges. In a recent paper, Polkovnichenko (2004) uses new preferences to explain the observed household portfolio allocations.

probability that he will pick a winner from 65 percent to 75 percent.[2] In this case, the bettor would prefer to bet on his football picks versus being rewarded for selecting a red ball from an urn with 75 out of 100 red balls. In the empirical analysis that follows, we test for the effects of overconfidence that flow through the competence channel, and also test for a separate overconfidence effect.

As described next, we argue that the level of competence an investor feels in making financial decisions changes his willingness to act on his judgments, and therefore is an important determinant of investor choices. We focus on two well-documented investment anomalies: too frequent trading and home bias.

B. Competence effect and trading frequency

Odean (1999) and Barber and Odean (2000, 2002) argue that investors tend to trade too often. In addition, the evidence suggests that single, young, male investors tend to trade the most frequently (Barber and Odean (2001)). This high trading activity is usually attributed to the psychological bias of investor overconfidence. In the finance literature, overconfidence is usually defined as overestimating the precision of information about the value of a financial security (Odean (1998), Gervais and Odean (2001)). This "miscalibration" leads to intensified differences of opinion, which in turn causes trading (Varian (1989), Harris and Raviv (1993)).[3]

Recently, the empirical link between miscalibration and trading frequency has been challenged. Deaves, Luedes and Luo (2004) find that miscalibation does not lead to higher trading frequency in their data. Glaser and Weber (2003) argue that there are three aspects of overconfidence, namely miscalibration, the "better-than-average" effect (i.e., people tend to think that they have higher than average skills), and illusion-of-control (i.e., the tendency to believe that one's personal probability of success is higher than objective probability would warrant). Using data from 215 online investors, they find that, contrary to the predictions of Odean (1998) and Gervais and Odean (2001), miscalibation does not lead to high trading frequency. However, the better-than-average effect is associated with more frequent trading. Glaser and Weber conjecture

[2]In the psychology literature, overconfidence can mean either believing that the distribution of your knowledge is tighter than it actually is or, like in this example, believing that your mean skill is higher than it actually is. In the text, we often use the term overconfidence in a general sense, though the meaning should be clear by the context of the surrounding text. As explained in the next footnote, when we explicitly refer to distributions that are too tight, we use the term miscalibration.

[3] In the psychology literature, miscalibration can mean either "expected probability not equal to realized relative frequency" or "believing that the precision of probability distribution is tighter than it really is." In our paper, miscalibration refers to subjective probability being tighter than true probability.

that an investor who believes himself to be better than average is more likely to maintain his opinion about the future performance of a stock, even though he knows that other market participants disagree with him. This contributes to differences of opinion about a stock, which leads to trading.

The competence effect is distinct from overconfidence. In the overconfidence framework, the traditional paradigm of maximizing expected utility still holds. Overconfidence increases trading frequency by increasing the heterogeneity of investor beliefs. We argue that high competence leads to high trading frequency, through a different mechanism. Investors are more willing to bet on their judgments when they feel more skillful or knowledgeable. In other words, they are more likely to act on their beliefs, and trade securities, when they feel more competent, and vice versa. Therefore, we hypothesize that when investors feel more competent, they tend to trade more frequently. This "willingness to act" aspect is absent in the overconfidence framework.

C. Competence effect and home bias

We now turn to the link between competence and an investor's portfolio allocation to foreign assets. The home bias literature shows that investors tend to allocate too much of their overall portfolio to domestic equities and too little to international equities (French and Porteba (1991), Lewis (1999)). Others have documented "home bias at home." Coval and Moskowitz (1999) find that U.S. fund managers exhibit a strong preference for firms with local headquarters. Huberman (2001) reports the geographical bias of regional Bell shareholders, i.e., a larger proportion of the shareholders of a regional Bell operating company tend to live in its service area than would be expected. Benartzi (2001) and Huberman and Sengmuller (2002) document that employees tend to invest a large proportion of the assets of their retirement plans in their own company stocks. "Home bias at home" has also been reported among Finnish (Grinblatt and Keloharju (2001)), Swedish (Massa and Simonov (2003)), and Chinese (Feng and Seasholes (2004)) investors.

What causes home bias? One explanation is information costs.[4] Investing in foreign equity markets may require understanding foreign accounting standards and legal environments. Coval and Moskowitz (2001) find that fund managers earn an extra 2.7% per year from their local investments compared to non-local investments. Therefore, they argue that a regional information advantage leads to "home bias at home." Vissing-Jørgensen (2003) finds that high wealth households are more likely to invest in foreign assets than are low wealth households. She argues that this is consistent with high wealth households paying the information cost associated with investing in foreign assets. However, several studies present evidence that cannot be explained by the information costs argument.[5] Benartzi (2001) and Huberman (2001) find that investors who demonstrate local bias do not experience superior returns, nor do they tend to trade more frequently. These results are not easily by an information advantage story. The behavioral finance literature offers an alternative explanation, namely, people tend to be more optimistic towards home markets than towards international markets (Kilka and Weber (1999), Strong and Xu (2003)).

In this paper, we argue that investor competence plays a role in explaining home bias. When an investor feels that he fully understands the benefits and risks involved in investing in foreign assets, he is more willing to take action to invest in foreign assets. On the other hand, when an investor feels incompetent, he is likely to refrain from taking action, thus leading to underinvestment in foreign assets. The same argument could be extended to "home bias at home."

One element of competence is familiarity (Huberman (2001)). Investors who are primarily familiar with their home country (versus being familiar with foreign countries) will have a tendency to invest primarily in home country stocks. But familiarity is not the whole story. Heath and Tversky (1991) emphasize that the competence effect also involves the feeling that an individual is good at investing in general, and in foreign stocks in particular. A U.S. investor can

[4] Other potential explanations for home bias include a) domestic equities provide better hedges for domestic risks; b) high cost of investing in foreign equities, e.g., international taxes, government capital restrictions, etc.; and c) prevalence of closely held firms in most countries causing the "world float portfolio" to be significantly different from world market portfolio. Further, Demarzo et. al. (2004) argue that frictions in goods markets causes investors in a local community to hold similar, under-diversified portfolios. Most empirical studies suggest that these effects are either too small to account for the degree of home bias observed in the data, or actually increase the degree of the bias (Cooper and Kaplanis (1994), Baxter and Jermann (1997), Tesar and Werner (1995), and Dahlquist et al. (2003)). See Lewis (1999) for a review.

[5] Using ownership data of individual Swedish firms, Dahlquist and Robertsson (2001) argue that foreign investors' apparent preference for stocks with less information asymmetry is actually due to these investors being mainly institutional investors, not due to information costs.

be unfamiliar with foreign languages and cultures but if he feels competent in his investing skills, he might be willing to allocate part of his portfolio to foreign markets.

One might be concerned that investor competence is correlated with the level of information an investor has. Thus, even if we do find foreign allocation to be increasing in investor competence, this could indicate an information advantage. To address this concern, in section IV.B, we show that investor competence is not positively associated with an investor's past returns. Therefore, it is does not appear that investor competence is positively associated with the investor's level of information in our sample.

III. Data Sources and Measuring Competence

We use data from the UBS/Gallup Investor Survey. Each month, UBS/Gallup conducts telephone interviews with approximately 1,000 randomly selected investors.[6] The UBS data represent a general investor pool, and this is important because a particular class of investors might exhibit certain characteristics that distinguish them from the general population. For example, Odean (1999) and Barber and Odean's (2000, 2001, 2002) evidence of excessive trading is obtained from one particular subset of investors -- investors who hold accounts with one discount brokerage firm. Using data from a single 401(k) plan, Agnew et al. (2003) find that the annual trading frequency in (401)k accounts is 0.26, less than one fifth of that reported in Odean (1999); and the annual asset turnover is 16%, less than one fourth of the turnover reported in Barber and Odean (2000). The large discrepancies between these numbers likely emanate from differences in behavior among different classes of investors. It is also possible that one investor may have multiple investment accounts, and manage these accounts differently due to institutional reasons, which might not be detected when studying one type of account. Using the UBS/Gallup data, we avoid this issue by studying decisions in relation to an investor's aggregate investment portfolio.

While the UBS data have the advantage of covering a wide range of investor classes and account types, there are disadvantages to using survey data. One can not be sure that respondents understand all the questions, nor that they answer truthfully. There can also be issues related to non-response bias (i.e., whether the respondent's answers are representative of the views of the general population). Also, the UBS data do not have detailed portfolio breakdowns at the

[6] The only criterion for an investor to be included in the survey is that the household total investment is more than $10,000.

individual stock level, so we do not know respondents' actual investment performance. As reported below, when there is overlap, we are able to replicate some of the existing results in the literature. This gives us confidence that our survey sample is representative.

The survey questions that are of particular interest to us are listed in Table 1. In the June 1999 and April 2000 surveys, respondents are asked to report their trading frequencies. The responses are coded in six categories, ranging from "at least once a day" to "less than once a year." In the March 2002, June 2002 and September 2002 surveys, participants are asked to report the percentages of their portfolios currently invested in assets of foreign countries or foreign currencies.

Table 2 reports the characteristics of the investors surveyed by UBS/Gallup. The investors are on average 49 years old, with median annual income of $67,500. These numbers are comparable to that of Barber and Odean (2001), whose sample of investors are on average 50 years old, with median annual income of $75,000. The investors in our sample are well educated: 60 percent have finished college, and 26 percent have post-graduate education.

To measure investor competence, we use data from the November 1996 survey. In this survey, investors are asked the following question: "How comfortable do you feel about your ability to understand investment products, alternatives and opportunities?" The responses range from 1 (very uncomfortable) to 5 (very comfortable). For the November 1996 survey, the average self-rated competence is 3.7.

To perform our empirical analysis, we need to measure investor competence, trading frequency, and degree of home bias. The survey question related to competence only appears in November 1996, which does not coincide with the appearance of either the trading frequency or the home bias questions. Therefore, we construct an empirical model for investor competence. We start by investigating the determinants of investor competence using the November 1996 data. We model competence as a function of investor characteristics such as gender, education, age and income. We also use the estimated coefficients from regressing competence on the characteristics to construct predicted competence for each investor on any given survey, including those surveys that contain the trading frequency and home bias questions.

Recall that competence is defined as the subjective skill or knowledge level in a certain area (Heath and Tversky (1991)). In our setting, investor competence is an investor's perceived financial skill or knowledge. We posited in section II.A that higher education and income make a person feel competent, which might lead to higher perceived competence in all domains,

including financial decisions. As shown in Table 3, we find that investor competence increases in education. For example, consider an average investor in our sample, a 48.7 year old, male investor, with annual income of $72,640. If education level were to increase from college to post-graduate, the predicted competence for this investor will increase from 4.01 to 4.42. Also consistent with our previous conjecture, investor competence increases with income – but the magnitude of this effect is small. For the typical male, college-educated investor in our sample, if income were to increase by one standard deviation (from $72,640 to $97,835) the expected investor's competence will increase from 4.01 to 4.09. Age does not significantly affect investor competence in our sample.

Table 3 also shows that male investors are more likely to feel competent than female investors. Comparing a 48.7 year old, college educated female investor, with annual income of $72,640, to a male investor with the same demographics, the gender differential accounts for an increase of 0.39 in predicted investor competence, from 3.62 to 4.01. Notice that in previous studies, gender has been used as a proxy for overconfidence (Barber and Odean (2001)). These authors argue that male investors are more overconfident than are female investors. If being male indeed proxies for overconfidence, this increase from 3.62 to 4.01 depicts the effect of overconfidence on competence that we described at the end of Section II.A. As described below, we also include gender as a stand-alone confidence variable in some of the analysis that follows. Finally, to investigate whether our competence variable is in fact distinct from overconfidence, we examine the correlation between the competence and male. The correlation between competence and gender is only 0.21 in the November 1996 data, so we conclude that our competence measure is distinct from overconfidence.

IV. Empirical Analysis of the Effects of Competence on Trading Behavior

A. Investor competence and trading frequency

Using our model of competence, we now investigate the relation between competence and trading frequency. Barber and Odean (2001) find that young, male investors tend to trade more frequently than older, female investors. Using Survey of Consumer Finance data, Vissing-Jørgensen (2003) finds that wealthier households tend to trade more frequently. Therefore, we control for gender, age, and income when studying trading frequency. Glaser and Weber (2003) report that the "better-than-average" aspect of overconfidence is associated with high trading

frequency. We attempt to control for this "better-than-average" aspect of overconfidence in the multivariate analysis below.

Table 4 reports univariate relations between trading frequency, investor competence, and other characteristics. Recall that in Section 2.2, we hypothesized that higher perceived competence increases an investor's propensity to act on his beliefs, and therefore competence should be positively associated with higher trading frequency. The results in Table 4 are consistent with this hypothesis. We observe a significant shift in the distribution of trading frequency as investor's competence changes. When competence is less than or equal to 4, 27.1% of investors trade at least once a month. When competence increases to greater than 4, 45.1% of investors trade at least once a month. Overall, the average days between trading for all investors are 93.7 days. For those investors with competence less than or equal to 4, the average days between trading are 109.8 days. In contrast, for those investors with competence greater than 4, the average days between trading are only 67.9 days. This large difference in days between trading is both economically and statistically significant and is consistent with more competent traders trading more frequently.

Given that we use survey data while many existing studies use actual trading data, it is important to determine whether our sample produces results similar to those in the extant literature. The results in Table 4 indicate that young, male investors with higher income and higher overconfidence trade more frequently than older, female investors with lower income and lower overconfidence. (These findings are confirmed in a multivariate setting in column 3 of Table 5.) These results are consistent with the findings of Barber and Odean (2001), Vissing-Jørgensen (2003), and Glaser and Weber (2003). Therefore, we find no evidence that the source of our data (i.e., a survey) is distorting our results.

So far, we have presented univariate analysis. In Table 5, we perform multinomial logit regressions to explore the relative importance of each variable in explaining trading frequency. There are six categories of trading frequency, coded as follows: category = 1 if trading frequency is "less than once a year"; 2 if "at least once a year, but not more than once a quarter"; 3 if "at least once a quarter, but not more than once a month"; 4 if "at least once a month, but not more than once a week"; 5 if "at least once a week, but not more than once a day"; 6 if "at least once a day." In the first column of Table 5, we regress trading frequency on investor competence. In this univariate regression, the effect of competence on trading frequency is positive and highly significant.

This result indicates that trading frequency increases with investor competence. The effect of competence is very large in magnitude. When investor competence increases by one standard deviation, from its mean level of 3.77 to 4.08, the probability of an investor trading more than once per week increases from 10.2% to 15.4%. While this increase in trading frequency is large, it is consistent with other implications from the data. Recall that holding age, income, education constant at the population averages, male investor competence minus female investor competence equals 0.39. From Table 4, we know that this 0.39 increase in competence on trading frequency leads to an increase in the proportion of investors who trade at least once per week from 8.5% (for female investors) to 13.4% (for male investors). Thus the gender effect is on par with the one standard deviation effect described above.

In the second column of Table 5, we investigate the effect of investor competence controlling for overconfidence (i.e., the "better-than-average" effect, as measured by an investor's forecast of his own portfolio return in the next twelve months minus his forecast of the stock market return in the next twelve months). As shown in Table 2, on average, an investor forecasts his own portfolio return to be 3.2% higher than market return in the next twelve months. For June 1999 and April 2000 surveys, the correlation between this measure of overconfidence and investor gender (equal to 1 if the investor is male, 0 if female) is 0.08, which is statistically significant at 0.05 level. The correlation between constructed competence and overconfidence for the June 1999 and April 2000 surveys is only 0.04, and not statistically significant.

We find that, after controlling for "better than average" overconfidence, the effect of competence remains highly statistically significant; the magnitude of the coefficient decreases only slightly, relative to the univariate regression coefficient reported in column 1. As might be expected given the results in other research, we also find that overconfidence itself has a positive effect on trading frequency.

Next we introduce more investor demographics, e.g., gender, education, age and income as control variables. Recall that investor competence is estimated using gender, education, age, and income; therefore, competence is highly correlated with these characteristics. In a regression not reported in Table 5, none of the coefficients on the explanatory variables is significant when all the variables are included, possibly due to multicollinearity between measured competence and the characteristics. To deal with this problem, we orthogonalize the characteristic variables as follows. First we estimate a logit regression using Male as the response variable, and investor competence as the explanatory variable. A new variable, MaleX, is computed as the residual of this regression. MaleX represents the variation in Male that is not captured by investor

competence. The same procedure is repeated to produce orthogonalized versions of the College, Post-Graduate, Age, and Income variables.

In column 5 of Table 5, we regress trading frequency on competence, overconfidence, and the orthogonalized explanatory variables. In this specification, the competence variable captures the effect of gender, education, and age on trading frequency *via the competence channel*. The orthogonalized "X" variables capture the effects of gender, education, and age that are independent of the competence effect.

In column 5, the coefficient for investor competence is positive and highly significant. The estimated coefficient is 1.535, which is very similar to 1.523, the coefficient estimate in column 1, where investor competence is the only explanatory variable. Interestingly, the coefficient for MaleX is not significant. In other words, investor competence captures most of the variation in Male that is associated with trading frequency. Barber and Odean (2001) argue that male investors tend to trade more frequently than female investors because male investors are more overconfident. Our results offer an alternative explanation: more frequent trading by male investors could be driven by investor competence. Neither of the coefficients for CollegeX and Post-GraduateX is statistically significant, which suggests that investor competence also captures the effect of education on trading frequency. In other words, education leads to feelings of competence, which in turn leads to an increase in trading frequency – but we find no evidence of an independent education effect.

The coefficient estimate for IncomeX is 0.012, and is statistically significant. This implies that only part of the effect of income on trading frequency is due to its association with investor competence. Comparing column 5 to column 3, among all the orthogonalized "X" variables, the coefficient for Age is least affected by orthogonalization. This is not surprising, because as shown in Table 3, the association between investor competence and age is small in magnitude and not statistically significant.

The results in Tables 4 and 5 are consistent with our first hypothesis: trading frequency increases with investor competence. Now we turn to our second hypothesis: higher investor competence leads to lower home bias.

B. Investor competence and home bias

In the March 2002, June 2002, and September 2002 surveys, investors report their foreign asset holdings (see Table 1). We use these data to investigate the relation between investor competence and home bias.

Vissing-Jørgensen (2003) reports that wealthier households tend to hold more foreign assets. Therefore, we control for income (our closet proxy to wealth) when we model home bias. Kilka and Weber (1999) find that people are more optimistic towards their home markets than international markets. Strong and Xu (2003) simultaneously survey fund managers around the world and find a strong tendency for these managers to be more optimistic about their home country market than about the rest of the world. The authors of both of these papers suggest that home bias is driven by this optimism. Therefore, when studying the relation between investor competence and home bias, we attempt to control for investor optimism towards the U.S. market.

In February 2002, May 2002, August 2002 and November 2002, investors respond to the following question: "Focus on the financial markets in four areas of the world and rank order them by how optimistic you feel about them. The financial markets are: in the United States, in Europe, in Japan, in countries often referred to as the emerging markets." We define a dummy variable, OptimismUS, equal to 1 if an investor is the most optimistic towards the U.S. markets, and zero otherwise. Overall, 72 percent of investors are more optimistic towards the U.S. market than towards financial markets in other regions of the world.

Since the optimism question is not asked in March 2002, June 2002, or September 2002 (the surveys that address foreign investing/home bias), we do not have a direct measure for OptimismUS for these surveys. Therefore, we construct an empirical model for optimism towards the US market in the same manner as we did for investor competence. We start by investigating the determinants of investor optimism towards the U.S. using data from the February 2002, May 2002, August 2002 and November 2002 surveys. We regress OptimismUS on investor characteristics, like gender, education, age and income. Then for all other surveys, we construct the predicted optimism towards the U.S. market for each investor using his individual characteristics and the coefficients obtained from the regression above. The mean fitted OptimismUS is 0.72. The correlation between fitted OptimsmUS and fitted investor competence is 0.37.

One might be concerned that an investor's optimism towards the US market is affected by current performance of the U.S. market, as well as investor demographics. To address this

possibility, we repeat the analysis allowing OptimismUS to be a function of both investor characteristics and state of the U.S. market, e.g., the concurrent return of S&P500 index, or University of Michigan's consumer sentiment index. The results are very similar to those reported below.

Table 6 reports univariate relations between home bias and investor competence, optimism towards the US market, gender, education, age, and income. There is significant home bias in our sample. Overall, 36.3% of all investors hold foreign assets. The remaining 63.7% of investors do not own any foreign assets. For those investors with competence less than or equal to 4, only 32.3% hold foreign assets. In comparison, when investor competence is greater than 4, 45.6% invest in foreign assets. This increase is highly significant, both economically and statistically. This evidence is consistent with our hypothesis that investor competence mitigates home bias.

We next turn to the effect of optimism towards the US market. If home bias is caused by optimism towards the home market, then higher OptimismUS should be associated with less foreign holdings. Indeed, when predicted OptimismUS is less than its average value of 0.72, 38.4% of investors choose to hold foreign assets. However, when OptimismUS is greater than 0.72, only 34.5% of investors choose to invest in international markets. The difference is statistically significant at 0.05 level. Although not a main focus of our study, this observed relation between home bias and OptimismUS is important. Existing papers like Kilka and Weber (1999) and Strong and Xu (2003) focus on optimism only, they do not study portfolio allocation. Therefore, these papers do not establish a link between optimism towards the home market and actual portfolio allocation. Our study links home market optimism with foreign asset holdings.

Multivariate regression results are reported in Table 7. The response variable is a dummy variable, set to 1 if an investor holds foreign assets. The first column of Table 7 shows that investors with higher competence are more likely to hold foreign assets, and investors with higher optimism towards the US market are less likely to hold foreign assets. The coefficients for both investor competence and OptimismUS have the predicted signs and are significant at the 0.01 level.

As discussed in Lewis (1999), most of the existing rational models on home bias fail to generate effects large enough to account for the magnitude of home bias observed in data. Therefore, it's interesting to analyze the economic significance of investor competence. It turns out that the effect of competence is economically very large. Holding OptimismUS constant at its mean of 0.72, when investor competence increases by one standard deviation to 4.05, the likelihood of an investor holding foreign assets increases from 35.7% to 46.5%. Holding

OptimismUS at its mean of 0.72, if investor competence increases to its maximum of 5, the probability that an investor holds foreign assets increases to 76.4%. Therefore, our estimated investor competence effects are economically large.

We next investigate whether the positive association between fitted investor competence and foreign asset holdings is due to the positive association between competence and education. It is possible that investors with better education are more likely to learn the benefits of international diversification, and therefore are more likely to hold foreign assets. To address this concern, we study whether the effects of investor competence and OptimismUS remain when we control for other investor characteristics, like gender, education, age and income.

Similar to the trading frequency analysis, because fitted competence and fitted OptimismUS are estimated using investor's gender, education, age and income information, these variables are correlated with each other. We address the multicollinearity problem by repeating the orthogonalization process described in Section IV.2. For example, we regress Male on Competence and OptimismUS. The residuals of this regression, called MaleX, represent the variation in Male that is not captured by Competence and OptimismUS.

The fourth column of Table 7 reports the effect of Competence on home bias, with OptimismUS and the orthogonalized investor characteristics as control variables. The estimated coefficient on the Competence variable remains highly significant and has the predicted sign. These results are consistent with our hypothesis that investors who feel more competent are more likely to participate in foreign markets. Interestingly, in Column 4, after the orthogonalization, none of the investor characteristic variables are statistically significant. This result suggests that these investor characteristics affect home bias via the competence and/or optimism channels. In particular, both collegeX and postGraduateX have statistically insignificant coefficients, so the only effect of education on home bias that we detect is through the competence channel.

As we discussed in Section II.C, an information story might explain home bias. For example, if the competence variable captures an investor's information advantage, instead of perceived knowledge/skills, our results might indicate that an information advantage increases an investor's likelihood of holding foreign assets. To distinguish between competence and information, one needs to distinguish between perceived knowledge/skills and actual information. We do this by considering the relation between information and returns. Investors who are better informed should earn higher returns than those less informed. However, investors who perceive themselves to be better informed may not earn higher returns. Therefore, if our measure of

investor competence captures subjectively perceived knowledge instead of true information, then there is no reason for it to be positively associated with realized abnormal returns.

In Table 8, we study the relation between realized portfolio returns in the twelve months prior to the survey and investor competence. To control for market conditions, we add fixed effects for each survey. We find no evidence that investor competence is associated with higher returns. In fact, the data indicate the contrary: a one-unit increase in investor competence is associated with decrease in annual returns by more than 6%. The evidence in Table 8 suggests that it is unlikely that our investor competence variable is simply capturing an "information effect."

Glaser and Weber (2004) survey approximately 200 online investors, and match their self-reported returns with the actual observed portfolio returns on their accounts. These authors find very low correlation between investors' self-reported returns and their actual observed portfolio returns, indicating that some investors may not know their true portfolio returns. Since investors with better education are more likely to know their true portfolio returns, in unreported analysis, we repeat the regressions in table 8 using only those investors with college education or higher. This sub-sample yields the same results as the full sample regressions reported in Table 8.

We do not have investors' actual portfolio holding data; therefore, we do not control for individual investors' risk exposure in the regressions in Table 8. Is it possible that investors with lower competence tend to take on more risk, and therefore earn higher returns on average? To address this possibility, for each survey, we calculate the mean self-reported portfolio returns for high and low competence investors. According to the CAPM, if low competence investors tend to take on more risk than high competence investors, then the mean returns for low competence investors should be more sensitive to market returns than those of high competence investors. As we show in Figure 2, this is not the case. The mean returns for both low and high competence investors are equally sensitive to market returns (i.e., the slopes on the lines are indistinguishable). There is no evidence that low competence investors take on more risk than high competence investors. Therefore, it does not appear to be the case that risk exposures drive the results in Table 8.

V. Conclusions

The competence effect predicts that the likelihood that a person will invest according to her own judgments increases with her perceived knowledge about investing. Unlike many empirical

studies of behavioral finance, which rely on proxies for underlying psychological biases, we directly measure investor competence through survey evidence. We first build an empirical model to understand the factors that affect investor competence. We find that male investors with higher income and more education are likely to feel like they are competent investors than are female investors with less income and education.

Next we study the effect of competence on investor behavior. The majority of existing empirical studies in behavioral finance use one psychological bias to explain one type of investor behavior. However, if a psychological bias is deeply ingrained, it should affect multiple aspects of investor behavior. In this paper, we study the effect of investor competence on two types of investor behavior: trading frequency and home bias. Trading frequency and home bias have long been treated separately in the literature. However, we show in this paper that both of these behaviors can be traced to investor competence.

We argue that investors who believe that they are more skillful or knowledgeable in making financial decisions should be more willing to act on their judgments. Indeed, our results indicate that investors who feel more competent tend to trade more frequently than investors who feel less competent. The competence effect also contributes to home bias. When an investor feels more competent about investing in foreign assets, he is more willing to shift a portion of his assets overseas. In contrast, when an investor feel less competent, he is more likely to avoid investing in foreign assets. Consistent with this argument, we find that investors with higher competence are more likely to invest in international assets.

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Table 1: Survey Questions, from UBS/Gallup Investor Survey

	Survey Questions	Data Availability
Trading Frequency	In general, how often do you trade in the financial markets?	June 1999 April 2000
Home Bias	What percent of your portfolio is currently in assets of foreign countries or foreign currencies?	March 2002 June 2002 September 2002
Investor competence	How comfortable do you feel about your ability to understand investment products, alternatives and opportunities? The responses range from 1 (very uncomfortable) to 5 (very comfortable).	November 1996
Overconfidence	What overall rate of return do you expect to get on your portfolio in the next twelve months? What overall rate of return do you think the stock market will provide investors during the coming twelve months?	June 1999 April 2000 February 2002 March 2002 May 2002 June 2002 August 2002 September 2002 November 2002
Optimism toward US market	Focus on the financial markets in four areas of the world and rank order them by how optimistic you feel about them. The financial markets are: in the United States, in Europe, in Japan, in countries often referred to as the emerging markets.	February 2002 May 2002 August 2002 November 2002

Table 2: Investor Characteristics
Overconfidence is measured as (forecast of own portfolio return in the next twelve months) minus (forecast of stock market return in the next twelve months). Data are from the following surveys: November 1996, June 1999, April 2000, February 2002, March 2002, May 2002, June 2002, August 2002, September 2002 and November 2002. The total number of observations is 7452.

	Percent	Mean (Median)	Std Dev
Competence (1=low, 5=high)		3.68 (4.00)	1.01
Optimism towards US market (1 = most optimistic towards US market, 0 = most optimistic towards a non-US market)		0.72 (1.00)	0.45
Overconfidence (%)		3.20 (0.00)	17.09
Education			
Less than college	40.02%		
College	33.76%		
Post-Graduate	26.22%		
Investment		$199,643 ($55,000)	$254,061
$10,000 - $100,000	58.62%		
$100,000 - $200,000	16.45%		
$200,000 - $500,000	13.90%		
$500,000 - $1 million	6.49%		
More than $1 million	4.54%		
Income		$72,640 ($67,500)	$25,195
Less than $50,000	23.22%		
$50,000 - $100,000	46.07%		
More than $100,000	30.70%		
Gender			
Male	59.15%		
Female	40.85%		
Age		48.70 (48.00)	13.95
< 30	7.63%		
30 – 40	22.46%		
40 – 50	28.34%		
50 – 60	22.31%		
>= 60	19.26%		
Self-reported previous one year return (%)			
All surveys		2.09 (5.00)	21.02

Table 3: Determinants of Investor Competence

Investor competence is measured as the response to the following survey question: "How comfortable do you feel about your ability to understand investment products, alternatives and opportunities?" The responses range from 1 (very uncomfortable) to 5 (very comfortable). Multinomial logit regression is used. ***, **, * denotes significance at 0.01, 0.05, and 0.10 respectively. Data are from the November 1996 survey.

	Estimate	Std Err
Intercept 5	-2.864***	0.353
Intercept 4	-1.265***	0.339
Intercept 3	0.659*	0.342
Intercept 2	2.308***	0.398
Male	0.766***	0.139
College	0.741***	0.167
Post-Graduate	0.921***	0.187
Age	0.006	0.005
Income	0.006**	0.003
Pseudo R^2	0.112	
No. of Observations	736	

Table 4: Trading Frequency.
Percentage of investors reporting frequency category. Competence is estimated using investor characteristics, including gender, education, age and income. Overconfidence is defined as forecast of investor's own portfolio return minus forecast of market return in the next 12 months. "Days between trading" is calculated at the mid-point of each response category. We test the effect of investor characteristics by comparing average days between trading at the lowest level of variable value with average days between trading at higher levels of variable values. ***, **, * denotes significance at 0.01, 0.05, and 0.10 respectively. Data are from June 1999 and April 2000 surveys.

	At least once a day	At least once a week	At least once a month	At least once a quarter	At least once a year	Average days between trading	No. of Obs.
All investors	3.1%	11.6%	34.0%	75.7%	93.7%	93.7	670
Competence							
<= 4	2.9%	11.1%	27.1%	69.3%	92.0%	109.8	413
> 4	3.5%	12.5%	45.1%	86.0%	96.5%	67.9***	257
Overconfidence							
<= 3.2%	2.8%	9.5%	32.5%	72.8%	93.1%	100.4	422
> 3.2%	3.6%	15.3%	36.7%	80.7%	94.8%	82.3**	248
Gender							
Male	3.5%	13.4%	40.3%	82.0%	95.6%	77.6	434
Female	2.5%	8.5%	22.5%	64.0%	90.2%	123.4***	236
Education							
Less than college	3.6%	11.8%	25.6%	68.2%	89.7%	115.2	195
College	2.4%	11.5%	35.3%	78.2%	96.4%	85.4***	252
Post-Graduate	3.6%	11.7%	39.9%	79.4%	94.2%	84.5***	223
Age							
<30	3.0%	21.2%	47.0%	87.9%	97.0%	66	62.0
30 – 40	6.4%	12.3%	39.0%	84.5%	98.4%	70.3	187
40 – 50	2.5%	10.5%	28.5%	70.5%	92.5%	106.6***	200
50 – 60	1.6%	11.3%	35.5%	75.8%	93.6%	93.3**	124
>= 60	0.0%	6.4%	24.7%	60.2%	84.9%	136.4***	93
Income							
Less than $50,000	1.2%	4.7%	18.8%	56.5%	84.7%	145.7	85
$50,000 - $100,000	1.3%	9.0%	28.0%	71.7%	92.5%	105.1***	321
More than $100,000	6.1%	17.0%	46.2%	86.7%	98.1%	63.2***	264

Table 5: Investor Competence and trading frequency.

Response variable is trading frequency. There are six categories, coded as following: category = 1 if trading frequency is "less than once a year"; category = 2 if trading frequency is "at least once a year, but not more than once a quarter"; category = 3 if trading frequency is "at least once a quarter, but not more than once a month"; category = 4 if trading frequency is "at least once a month, but not more than once a week"; category = 5 if trading frequency is "at least once a week, but not more than once a day"; category = 6 if trading frequency is "at least once a day". Competence is estimated using investor characteristics, including gender, education, age and income. Overconfidence is measured as (forecast of own portfolio return in the next twelve months – forecast of stock market return in the next twelve months). College and Post-Graduate are dummy variables which are set to 1 if investor reports education level of college and post-graduate respectively, and 0 otherwise. Male is dummy variable, equal to 1 if the investor is male; 0 if investor is female. Income is categorical. We take the mid point of each category. The top category for income is "more than $100,000 per year". Income in this category is set to be $100,000. MaleX is the residual of the following logit regression: regress Male onto Competence. CollegeX, Post-GraduateX, ageX, and IncomeX are calculated in the same manner. Intercepts are not reported. Standard errors are in parentheses. The 1% and 99% outliers of Overconfidence are deleted. ***, **, * denotes significance at 0.01, 0.05, and 0.10 respectively. Data are from June 1999 and April 2000 surveys.

	(1)	(2)	(3)	(4)	(5)
Competence	1.523***	1.506***			1.535***
	(0.244)	(0.244)			(0.245)
Overconfidence		1.991**	1.424		1.381
		(0.917)	(0.926)		(0.926)
Male			0.670***	0.686***	
			(0.154)	(0.154)	
College			0.134	0.124	
			(0.182)	(0.182)	
Post-Graduate			0.165	0.160	
			(0.189)	(0.190)	
Age			-0.025***	-0.026***	
			(0.006)	(0.006)	
Income			0.019***	0.019***	
			(0.004)	(0.004)	
MaleX					-0.342
					(0.690)
CollegeX					-0.820
					(0.670)
Post-GraduateX					-1.052
					(0.818)
AgeX					-0.033***
					(0.008)
IncomeX					0.012*
					(0.006)
Pseudo R^2	0.058	0.064	0.126	0.124	0.129
No. of Obs	659	659	659	659	659

Table 6: **Home bias**

Percentage of investors who own foreign investments. Competence and OptimismUS are estimated using investor characteristics, including gender, education, age and income. We test the effect of investor characteristics by comparing decision to invest in foreign assets at the lowest level of variable value with the decision to invest in foreign assets at higher levels of variable values. ***, **, * denotes significance at 0.01, 0.05, and 0.10 respectively. Data are from March 2002, June 2002 and September 2002 surveys. The total number of observations is 2483.

	Own foreign investment	No. of Obs.
All investors	36.3%	901
Competence		
<= 4	32.3%	561
> 4	45.6%***	340
OptimismUS		
<= 0.72	38.4%	437
> 0.72	34.5%**	464
Gender		
Male	39.1%	578
Female	32.2%***	323
Education		
Less than college	27.4%	272
College	37.9%***	328
Post-Graduate	48.1%***	301
Age		
<30	33.9%	64
30 – 40	43.0%**	233
40 – 50	38.8%	273
50 – 60	35.2%	194
>= 60	27.5%	137
Income		
Less than $50,000	24.8%	135
$50,000 - $100,000	36.4%***	435
More than $100,000	44.6%***	331

Table 7: Investor competence and home bias

Dependent variable is participation in foreign assets, equal to 1 if investor holds foreign assets, and 0 otherwise. Competence and OptimismUS are estimated using investor characteristics, including gender, education, age and income. College and Post-Graduate are dummy variables which are set to 1 if investor reports education level of college and post-graduate respectively, and 0 otherwise. Male is dummy variable, equal to 1 if the investor is male; 0 if investor is female. Income is categorical. We take the mid point of each category. The top category for income is "more than $100,000 per year". Income in this category is set to be $100,000. MaleX is the residual of the following logit regression: regress Male onto Competence and OptimismUS. CollegeX, Post-GraduateX, ageX, and IncomeX are calculated the same way. Data are from March 2002, June 2002, and September 2002. Intercepts are not reported. Standard errors are in parentheses. ***, **, * denotes significance at 0.01, 0.05, and 0.10 respectively.

	(1)	(2)	(3)	(4)
Competence	1.374***	1.147***		1.402***
	(0.147)	(0.135)		(0.150)
OptimismUS	-3.475***			-3.627***
	(0.844)			(0.863)
Male			0.190**	
			(0.089)	
College			0.308***	
			(0.104)	
Post-Graduate			0.708***	
			(0.112)	
Age			-0.009***	
			(0.003)	
Income			0.009***	
			(0.002)	
MaleX				-0.329
				(0.353)
CollegeX				-0.110
				(0.207)
Post-GraduateX				0.393
				(0.321)
AgeX				-0.022
				(0.017)
IncomeX				0.003
				(0.005)
Pseudo R^2	0.037	0.030	0.047	0.047
No. of Obs	2483	2483	2483	2483

Table 8: Investor competence or information advantage

Dependent variable is self-reported return of the previous twelve months, measured in percentage. Competence and OptimismUS are estimated using investor characteristics, including gender, education, age and income. Mar02 is a dummy variable, set to 1 if data is from March 2002 survey, zero otherwise. June02 is defined similarly. Data are from March 2002, June 2002, and September 2002. Standard errors are in parentheses. ***, **, * denotes significance at 0.01, 0.05, and 0.10 respectively.

	(1)	(2)
Intercept	26.113***	20.799***
	(7.409)	(5.360)
Mar02	6.988***	7.007***
	(1.164)	(1.164)
June02	7.077***	7.077***
	(1.183)	(1.183)
Competence	-6.486***	-6.998***
	(1.496)	(1.143)
OptimismUS	-9.936	
	(9.564)	
Adjusted R^2	0.039	0.039
No. of Obs	1723	1723

Figure 1. Percentage of participants that choose their own judgments over matched chance lotteries

The horizontal axis is the self-rated probability of a participant's judgment being correct. The vertical axis is the percentage of participants that choose their own judgments over matched chance lotteries. This figure is adapted from Heath and Tversky (1991), Figure 4.

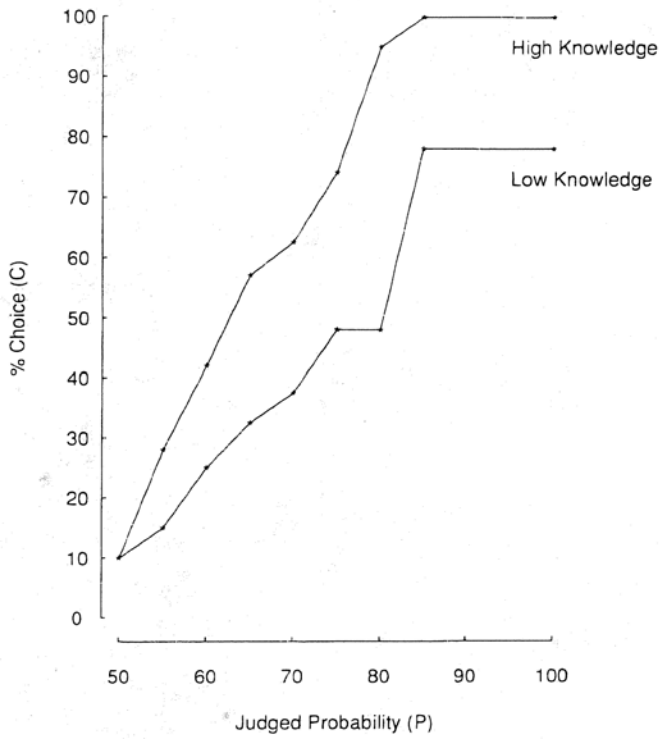

Figure 2. Mean returns of low competence and high competence investors

The horizontal axis is the previous twelve months return of S&P500 index. The vertical axis is the mean portfolio returns for low and high competence investors. Low competence is defined as competence less than or equal to 4; high competence is defined as competence greater than 4. ▲represents low competence investors, ♦ represents high competence investors. Data are from March 2002, June 2002, and September 2002.