Financial Literacy and Mutual Fund Investments: Who Buys Actively Managed Funds?

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Abstract

Using data from an online survey with more than 3,000 mutual fund customers we construct a financial literacy score based on quiz-like statements. Our objective measure of financial literacy is significantly correlated with several socioeconomic and demographic variables. We also document a positive correlation between financial literacy and better than average (BTA) thinking in terms of investment skills. With respect to mutual fund investments, there is mixed evidence on the influence of financial literacy. While more sophisticated participants pay lower front-end loads, are less biased in their past return estimates and less miscalibrated in their return forecasts for their own fund as well as for the whole stock market, no relationship exists between financial literacy and ongoing fund expenses. Moreover, financial literacy has only a slight impact on the decision to buy a passive fund rather than an actively managed fund. Our results indicate that the lack of financial literacy among most mutual fund customers cannot completely explain the growth in actively managed funds over the past. The higher level of BTA among more sophisticated investors is modestly responsible for this finding.

Keywords: financial literacy, investor sophistication, mutual funds, mutual fund customers, sales loads, better-than-average, miscalibration

JEL Classification Code: G11

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1 Introduction

Why do investors buy actively managed funds? Mutual fund performance has been evaluated by numerous studies in the U.S., as well as in other markets and overwhelming evidence shows that actively managed funds underperform their benchmark after (and sometimes even before) fees. Given the little value that these funds seem to offer to their shareholders, it is puzzling why they have become such a popular investment product for many individuals over the past decades. If one takes into account the enormous size of the industry, resolving this issue is of high economic relevance. In the U.S., for instance, total assets held by mutual funds soared from $200 billion in 1980 to more than $11 trillion at the end of 2006; whereby approximately 85% of these assets were under active management.[1] Other countries have seen similar growth rates. For example, in Germany total value invested in funds summed up to EUR 1.4 trillion at the end of September 2007.[2] The importance of the mutual fund business also becomes evident if one considers the fees paid by its customers. Khorana et al. (2006) estimate that investors around the world paid more than $63 billion solely for annual management fees in 2002. And with regards to the worldwide trend to privatized pension plans and the increased responsibility that households are given in making financial decisions, it seems likely that this trend will continue.

Using fund flow data, some researchers have argued that superior selection abilities of mutual fund investors might provide a rationale for them to rely on active management. Gruber (1996) calls this the smart money effect. So far, the empirical evidence on whether mutual fund customers can identify superior funds is mixed, though (see Gruber (1996), Zheng (1999), Sapp and Tiwari (2004) and Keswani and Stolin (2008)). Superior selection skills imply that mutual fund performance is persistent to a certain extent. Until now, there is still no definite consensus on this issue. Some recent studies have claimed to be able to separate good from bad funds by using more developed measures of skill rather than past performance (see e.g. Cohen et al. (2005), Kacperczyk et al. (2006), Baks et al. (2006), and Cremers and Petajisto (2007)).

[1] See Investment Company Institute (2007), p. 1.

[2] See Bundesverband Investment und Asset Management e.V. (2007), p. 2.

However, considering the results of previous surveys from the U.S. which indicate that the typical mutual fund customer is not very well-informed about his mutual fund investments, it is hard to believe in a smart money effect, even though there might be some persistence in mutual fund performance. In general, investors seem to be unaware of the risks, returns and especially the costs associated with actively managed funds (see e.g. Capon et al. (1996) and Alexander et al. (1998)). For instance, Alexander et al. (1998) document that less than 20% of all survey participants were able to give an estimate of the costs associated with their largest mutual fund.

Overall, the survey results show that financial knowledge must be considered to be limited at best among most fund investors and that financial literacy is likely to be one of the keys in understanding private investors' mutual fund investments. To put it simply: Unsophisticated investors, unaware of the fact that investing in actively managed funds is an inferior strategy, might direct their money towards funds based on advertising and brokerage advice. Therefore, an examination of the relevance of financial literacy is the major focus of our study. We analyze how financial literacy affects perceptions about major fund attributes such as past performance and risk, and helps to come up with more realistic assessments. In addition and more importantly, our study sheds light on whether higher levels of financial literacy coincide with improved mutual fund investment decisions. In particular, we examine whether more sophisticated investors put more emphasis on mutual fund expenses like front-end loads and annual management fees. We also examine how financial literacy affects the tendency to rely on actively managed funds rather than their low-cost passively managed alternatives: index funds and exchange traded funds (ETF).

Besides financial (il-)literacy, overconfidence could also play a role in explaining the strong reliance on actively managed funds. Even in the absence of a true smart money effect, investors might be overconfident enough to believe they have the ability to identify funds that can beat their benchmark. Clearly, if subjects overestimate their picking abilities, they will invest more in active management. Hence, we hypothesize that there is a positive relationship between better than average (BTA) thinking in terms of investment skills and the likelihood to buy actively managed funds.

We test our hypotheses using data from an internet survey conducted in cooperation with

a large German newspaper in May 2007. Our objective measure of financial literacy in the investment domain is based on 8 quiz-like statements. Though internet surveys have some disadvantages (including a potential selection bias, response biases and a lack of portfolio data), the benefits are numerous. Most importantly, while information about mutual funds is widely accessible, information on mutual fund investors (who they are and what they think) is generally not. The online survey was conducted to reduce this gap. We collected data on more than 3,000 mutual fund investors who participated in the study and varied with respect to several important dimensions including the distribution channel, residence and especially financial literacy.

Our main findings can be summarized as follows. First, we show that more financially sophisticated participants pay lower front-end loads, are less biased in their past return estimates and less miscalibrated in their volatility estimates not only for their own fund but also for the whole stock market. However, financial literacy is not associated with lower annual management fees despite the fact that ongoing expenses are clearly more important for long-term investors. And while there is a positive relation between financial literacy and the likelihood to purchase an index fund or ETF, it is surprisingly weak. Even though our participants can be considered to have a higher level of financial literacy than the subjects surveyed in previous U.S. studies, only around 7.6% of them stated a fund with a passive investment style as their latest purchase. Also, the likelihood of a passive fund being chosen a passive fund increases only slightly with higher levels of investor sophistication. In line with our expectations, respondents that display a higher BTA level are less likely to buy index funds or ETF. Interestingly, we also document a positive relationship between financial literacy and BTA, which can modestly explain why financial literacy has only a weak influence on the likelihood to buy passive funds. The results of the present study are consistent with the notion of two distinct groups of actively managed fund customers. The first group is made up of relatively unsophisticated customers, who buy actively managed funds based on interpersonal advice and advertisement. The second group consists of sophisticated investors who believe to have some sort of fund selection ability and select funds on their own. There is evidence that those clientele self-select into different distribution channels.

Besides the mutual fund literature, our paper is also related to studies which analyze the

consequences of low financial sophistication in the field of investing in general. Recently, policy makers and economists alike have started to acknowledge the importance of this issue. As previously mentioned, today people are expected to actively participate in financial markets. These studies show that low levels of financial literacy are related to several puzzling investment behaviors. As such, financially illiterate individuals are less likely to engage in stock markets (see Kimball and Shumway (2006) and van Rooij et al. (2007)), hold under-diversified portfolios (Goetzmann and Kumar (2005)) and save less for their retirement (see e.g. Lusardi and Mitchell (2006)). The results of those studies suggest that improving financial literacy is crucially important to enhance financial well-being. However, our findings call the universal acceptance of this notion at least partly into question.

The remainder of the study has the following structure. In section 2 we describe the design of our study, illustrate some descriptive results and formulate the hypotheses to be tested. In section 3 we analyze which personal characteristics drive the level of financial literacy and BTA. Sections 4 and 5 analyze whether more financially literate subjects have more realistic assessments of the return and risk characteristics of their mutual funds and put more emphasis on mutual fund expenses. Section 6 contains the main finding of our paper, specifically how financial literacy and BTA thinking affect the decision to invest in actively managed funds instead of passive products. A short summary, discussion and conclusion are provided in section 7.

2 Hypotheses, design and summary statistics

2.1 Hypotheses

Figure 1 presents the hypotheses to be tested in this paper. For reasons stated in the introduction, the major prediction of our study is that financial literacy is inversely related to the likelihood of purchasing actively managed funds, while BTA is positively related. Since this proposition suggests that financial literacy and BTA are two distinct investor characteristics, we first test whether they can be explained by a set of personal variables. Previous research found that age, education and income are positively related to financial

literacy (Hogart and Hilgert (2002); for age some studies report a hump-shaped relationship, e.g. ANZ (2003)) and that women are on average less financially sophisticated than men (see e.g. Lusardi (2006)). Alexander et al. (1997) find evidence that people self-select into direct and indirect distribution channels based on their financial sophistication. Thus, we expect our internet dummy to be a good predictor for the level of financial literacy as well. In addition to these variables, we hypothesize that subjects with higher household net wealth, subjects who work in the financial services sector and subjects who live in zip codes with a higher total population display a higher level of financial literacy. The total population indicates whether the respondent lives in a rural area or in a city.

Insert figure 1 here

With respect to BTA, much less is known about its demographic and socioeconomic determinants. One exception to this is gender, where most studies document that male subjects are more overconfident. The study closest to ours here is by Bhandari and Deaves (2006), who report higher levels of overconfidence among highly-educated males, subjects who invest for themselves and who are nearing retirement. However, they model overconfidence in terms of overestimation of the precision of one's knowledge and not in terms of BTA. In contrast, current research on BTA focuses on the stability of BTA effects. These studies show that easy tasks tend to produce BTA effects, whereas hard tasks are associated with worse-than-average thinking (e.g. Larrick et al. (2007) and Moore (2007)). We do not call into question that BTA is task-dependent. And especially in the investment domain, BTA thinking is likely to be fluctuating over time too. Nonetheless, we hypothesize that BTA is to some extent a stable personal characteristic and can be explained by some underlying socioeconomic and demographic variables like income, wealth and education.

We also analyze the influence of financial literacy and BTA on the accuracy of the participants' risk and return expectations. Previous studies found that subjects tend to be overly optimistic about the return and volatility of their investments in the stock market (see e.g. DeBondt (1998)). Regarding the mutual fund industry, such unrealistic beliefs about the abilities of fund managers to generate high returns at low risks might contribute to the growth in actively managed funds. This is the argument of Goetzmann and Peles (1997) who find that mutual fund customers indeed overestimate past fund performance.

They consider the phenomenon of cognitive dissonance (see Festinger (1957)) as a possible explanation for their results. Also, cognitive dissonance might cause the asymmetrical relationship between mutual fund flows and past performance as documented by Sirri and Tufano (1998). The theory claims that individuals (unconsciously) alter their beliefs to justify their past actions, in order to avoid any cognitive discomfort. In addition to that, the desire to reduce cognitive dissonance may explain why individuals do not stop investing in actively managed funds: even though previously purchased funds might have performed poorly, investors will not learn from their mistakes, because poor performance is suppressed. Our initial assumption is that higher levels of financial literacy (BTA) coincide with more (less) accurate return and risk assessments.

Various empirical studies document a strong and negative impact of fund expenses on future fund performance (for both loads and ongoing expenses; see e.g. Elton et al. (1993) and Carhart (1997)). Despite this evidence, empirical and experimental research suggest that insensitivity to mutual fund expenses is widespread among fund customers (see e.g. Cronqvist (2005) and Wilcox (2003)), even if their importance for future returns is without a doubt like in the case of index fund choices (see Elton et al. (2004) and Choi et al. (2006)). In section 5, we test our expectation that more financially sophisticated investors buy funds with lower charges which is in line with the results of previous studies that find a positive relationship between financial literacy and improved investment decisions. We suppose that BTA investors put lower emphasis on mutual fund costs because they think to have the ability to identify funds with higher returns that offset higher fees.

2.2 Design and summary statistics

Our study is based on a combination of several data sets. Our main data was gathered via an an internet survey on investment fund choice which we conducted in May 2007 in cooperation with the Frankfurter Allgemeine Sonntagszeitung, a large and well-known German newspaper. In addition to the survey data, we used Datastream to calculate fund returns and OnVista to obtain relevant fund characteristics such as the funds' age, regular front-end load and management fee. Finally, we collected data from the Federal Statistical Office of Germany on the population size within the zip code area of each participant.

The internet survey took place within a two-week period and started after an initial report in the newspaper. The report was written to increase the readers' awareness and contained instructions on how to participate. It did not deal with any of our research questions to guarantee unbiased results. Prospective respondents could follow a link at the web-site of the newspaper, while the questionnaire itself was placed on our web-site. To offer subjects an incentive for participation, they received an individual report on their answers and could also take part in a lottery. Prizes included a meeting with fund managers of a large German investment fund company, several investment fund shares and books. It was clearly stated in the instructions that winners were selected in a random drawing and not based on any answers. Participants received their individual report at the end of June 2007 via e-Mail, which they were able to state after completing the questionnaire.

We divided the questionnaire into 4 different parts: Questions on subjective financial knowledge, BTA and information gathering (A), questions concerning the latest stock or balanced fund purchase (B), return forecasts over the next year for the stock market (DAX 30) and the investment fund stated in part B (C) and ETF knowledge, financial literacy, and various socioeconomic/demographic questions (D).

We restricted our questions to the latest fund purchase in part B, because we were concerned that people might have difficulties with the recall of earlier purchases. The information that we collected in B from the investors was i) the distribution channel used, ii) the name of the fund, iii) an estimate of the fund's raw net-return over the last year, iv) an estimate of the front-end load paid, v) an estimate of the fund's management fee, and vi) whether they still possess any fund shares.[3] If people had already invested in a stock fund, they were asked to give some information on their latest stock fund purchase. Otherwise they were asked to provide information on their latest balanced fund buy. Part B was skipped if the respondent had never bought a stock or balanced fund. For part C,

[3]Participants could refuse to give a response if they did not know the answers to the questions. Fund names could be selected from a drop-down list which was based on the Bundesverband für Investment und Asset Management (BVI) sales database last updated in February 2007. The BVI is comparable to the Investment Company Institute in the U.S. If respondents were not able to find their fund in the list, they could type in the name manually. Approximately 70% found their fund in our list and we were able to assign an ISIN to the fund names that were typed in manually for 85% of all cases. Subjects were given help texts containing an explanation about what the front end load and the management fee are, and on how to compute the net-return. In the introduction of part B we instructed participants not to look up any answers. As a robustness test we checked whether the accuracy of the subjects' responses was related to the time needed to complete the questionnaire. We found no significant correlation at the 10%-level.

2 different questionnaire versions were placed on the server to control for order effects. However, we do not find that the order of the questions has an influence on the results. In part D participants got a short explanatory note on index funds and ETF before they were asked whether they had been aware of these funds.

Overall 3,228 subjects participated in the survey. 142 observations which were likely to suffer from a response bias were excluded from the analysis.[4] Thus, the answers of 3,086 respondents remain. Average time needed to complete the questionnaire was 8.5 minutes for those who were not excluded. A major problem of internet surveys is that subjects might deliberately falsify their responses. However, there are only few unrealistic data entries, e.g. for the return forecasts. Winzorisation of subjects' estimates at the 1%-level eliminates this problem. Table 1 gives an overview on the data that we collected and clarifies how we measured our variables of interest. Table 2 provides the reader with summary statistics.

Insert Table 1 here

Insert Table 2 here

As it can be inferred from Table 2 respondents generally perceived themselves as financially literate. The average self-assessed financial knowledge on a 5-point Likert scale, with 5 indicating an excellent level of financial knowledge, is 3.57. To examine whether subjects were prone to the better-than-average effect (BTA) concerning the success of their investment decisions, we asked participants on a scale with the endpoints "1 = strongly disagree" and "5 = strongly agree" how much they tend to agree with the following statement: "On average I am able to select securities which deliver superior returns compared to those securities selected by a typical investor."

The mean BTA score is 3.10 which is only marginally but statistically significant ($p<0.01$) above 3. Hence, the respondents in our sample are slightly overconfident. Based on the participants' distribution channel, we constructed the variable "Internet Channel"

[4]We excluded all participants who i) filled out the questionnaire twice, ii) needed less than 3 minutes to complete the questionnaire and iii) skipped questions by manually typing the URL in their browser. While our procedure is arbitrary, the results are unchanged if we do not exclude any respondent.

which equals 0 for customers using "traditional channels" (retail banks, financial services providers and miscellaneous) and 1 for customers using the internet (online brokers, online fund brokers and direct fund customers). Roughly half of our participants (52%) can be classified as retail customers. The average estimate for the last year's fund return is 16.14%, while the median is 15%, indicating that the distribution is slightly skewed to the left. The realized mean (median) past return for all funds for which got net asset value data from Datastream is 15.85% (15.29%). The mean (median) front-end load paid was 1.99% (2.00%) according to the subjects' statements. This contrasts with a mean (median) regular front-end load for the funds in our sample of 4.40% (5%). Since loads vary with the distribution channel (online brokers usually offer discounts) and shares can be acquired via the stock exchange in Germany for some funds as well, the difference does not necessarily imply a misjudgement of the load payments. Respondents stated a mean (median) management fee charge of 1.35% (1.50%) which is very close to actual expenses (mean 1.36% and median 1.50%). Overall, summary statistics indicate that participants seem to have quite realistic assessments concerning the returns and operating expenses of their funds and pay much lower loads than regularly charged (these issues will be explored in greater depth in sections 4 and 5).

To elicit return forecasts for the stock market in general as well as for their own fund, we asked individuals to submit a median return forecast as well as upper and lower bounds for the 90% confidence intervals for the return in one year. The DAX 30 was used to represent the general stock market, since it is the most well-known stock index in Germany. We utilize the three points of the return distribution to get a measure for the expected return and a measure of the perceived risk in the stock domain.[5] As you can see from Table 2, return forecasts appear to be reasonable, with a mean return of 11.88% for the own fund and 10.04% for the DAX 30.[6] However, volatility is expected to be very low implying that participants tend to underestimate the risks associated with equities. Mean expected

[5]See Keefer and Bodily (1983), pp. 596-597. The expected return μ_{ij} for each underlying i and each subject j is calculated as follows: $\mu_{ij} = 0.4 * x_{ij}(0.5) + 0.3 * [x_{ij}(0.1) + x_{ij}(0.9)]$, where $x(0.1)$ and $x(0.9)$ stand for the lower and upper bound and $x(0.5)$ represents the median forecast. To estimate the subjects' perceived volatility (risk) of the indices and their fund σ_{ij}, we employ the extended Pearson-Tukey approximation: $\sigma_{ij} = \sqrt{[(0.3 * x_{ij}(0.1))^2 + (0.4 * x_{ij}(0.5))^2 + (0.3 * x_{ij}(0.9))^2] - [\mu_{ij}]^2}$.

[6]We do not control for fund styles and regional focus here. Therefore, differences in return forecasts are not necessarily the result of overconfident investors but could be rationale.

volatility is 7.13% for their own fund and 7.10% for the DAX 30.

We construct an aggregate financial literacy score based on 8 quiz-like statements to examine the investors' level of financial literacy, our major variable of interest. Subjects were asked to indicate whether the statements were true or false, but they could also select a "don't know"-box. Similar approaches to obtain an objective measure of financial literacy can be found in other studies (see e.g. Choi et al. (2006) and Kimball and Shumway (2006)). Unfortunately, a universally accepted measurement scale for financial literacy has not been developed yet (for an overview see OECD (2005)). Thus, researchers usually construct their own scale. We do the same. Our statements are listed in the Appendix, along with the percentages of correct and wrong responses. We tested our statements with 241 students from an introductory course in investment and finance at the University of Mannheim. The mean (median) number of correct responses among the students is 4.95 (5). The survey respondents have a mean (median) financial literacy score of 6.29 (7.00) suggesting a high level of financial literacy in our sample. The rather high level of financial literacy raises concerns about a potential sample selection bias. Clearly, our subjects are not likely to be representative of the typical mutual fund customer, especially if one takes into consideration the low levels of financial literacy revealed by fund customers in previous studies. However, we find a considerable variation in subject's score values, allowing us to test our hypotheses.[7] Another concern which emerges as a consequence of our survey method is that respondents might have looked up whether our statements were true or false. However, the correlation between the time needed to complete the questionnaire and the number of correct responses is very low (0.007) and statistically insignificant (p=0.70). We conclude that there is no systematic response bias which distorts the quality of our data.

Socioeconomic and demographic data which were collected include age, gender, residence, profession, education, income and household wealth. Note that most of the information was collected via binary choice variables in order to enhance the respondents willingness and ability to answer the questions. Our participants are mostly male (90%) and highly educated on average. 59% live in a district with more than 50,000 inhabitants and 16%

[7]Note also, that the lack of representativeness rather strengthens some of our results. The high average level of financial literacy and the low number of passive funds purchased provide support for our argument that the lack of financial literacy typically observed among fund investors cannot completely explain the growth in actively managed funds puzzle, for instance.

work in the financial services industry.

3 Socioeconomic and demographic determinants of financial literacy and BTA

3.1 Correlation analysis

This section investigates which socioeconomic and demographic characteristics determine our objective measure of financial literacy and to what extent. A number of studies relying on portfolio data proxy financial literacy respectively investor sophistication with demographic variables, thereby assuming a direct relationship. For example, Dhar and Zhu (2006) and Feng and Seasholes (2005) use directly observable investor characteristics like wealth, occupation, gender or age to examine whether more financially literate investors exhibit a lower disposition effect. Similarly, Goetzmann and Kumar (2005) proxy for financial literacy with socioeconomic and trading data to analyze whether less sophisticated investors hold more under-diversified portfolios. Hence, it is interesting to examine how well the various variables can actually describe financial literacy. We also examine which personal characteristics influence the existence and degree of a BTA effect. The Pearson correlation coefficients between our objective financial literacy score, subjective financial literacy, BTA and various socioeconomic and demographic variables are illustrated in Table 3.

Insert Table 3 here

The correlation between the financial literacy score and self-assessed financial literacy is 0.42 ($p<0.01$) indicating a strong and positive relationship. Furthermore, Table 3 highlights that objective financial literacy as well as subjective financial literacy are related to socioeconomic and demographic characteristics as expected with two notable exceptions. Essentially, higher literacy scores coincide with subjects being male, purchasing funds online, working in the financial services sector, enjoying a better education, having a higher income and being wealthier. The correlations are all statistically significant at the 1%-threshold but rather low. Contrary to our expectations, age and residence are

not significantly correlated with financial literacy.[8] The absence of a relation between the population size of the participants' districts and the level financial sophistication is surprising.

The correlations between BTA and gender, the internet dummy, the finance profession dummy, income and wealth are similar to the ones observed for financial literacy. Also, all coefficients are statistically significant at the 1%-level. Residence and BTA have a small negative correlation of -0.04 ($p<0.05$) indicating that BTA is less widespread among subjects living in cities. However, in contrast to financial literacy, higher levels of education are not associated with a higher degree of overconfidence.

We also find a medium-sized positive correlation of 0.19 between objective financial literacy and BTA ($p<0.01$) which could be driven by the fact that several personal characteristics influence financial literacy and BTA in the same direction. Additionally, financial literacy could itself exacerbate the social-comparison bias. While there has been only little work done on the relationship between expertise and BTA, it seems natural to assume that a higher level of sophistication in a certain domain is related to the believe to be above than average in that domain. In the finance domain, Glaser et al. (2005) find that market professionals who work in a bank (investment bankers and traders) tend to be even more overconfident when assessing their performance on financial knowledge questions than a control group of students. However, under the assumption of efficient markets one must question that more knowledge helps to select investments with superior performance. The correlation between BTA and self assessed financial literacy is even more pronounced (0.43; $p<0.01$). Obviously, people who think to be sophisticated - whether justified by their objective financial literacy score or not - also believe to achieve higher than average returns.

3.2 Regression analysis

Next, we examine which factors actually determine the overall level of financial literacy and BTA. In order to do so, we first regress the individuals' financial literacy score on the

[8] As mentioned in subsection 2.1, one could argue that a non-linear relationship between age and financial literacy causes the low correlation, e.g. that especially younger and older respondents display lower levels of financial literacy. There is no evidence of existing age cohorts, though.

personal characteristics that we investigated previously. The results of the multivariate regressions are shown in Table 4.

Insert Table 4 here

In column 1, the results of an OLS-regression are reported. Overall, our findings are broadly consistent with the correlation analysis, i.e. gender, internet channel, the profession dummy, education, income and wealth are positively related to financial literacy (with p-values mostly below 0.01). The residence dummy has no influence on financial literacy, while age is marginally negatively related. Note that the R^2 is rather low, indicating that the personal characteristics do a rather poor job in explaining financial literacy. To compare the strength of the independent variables, column 2 reports the beta coefficients which express the change of the dependent variable in standard deviations if the independent variables change by 1 standard deviation.[9] As you can see, the finance profession dummy has the strongest impact on financial literacy followed by gender and education. We now repeat the regression but include the self-assessed level of financial knowledge as independent variable (see columns 3 and 4).[10] In that case, the goodness-of-fit measure more than doubles and the beta coefficient of self-assessed financial knowledge is the largest. Our findings suggest that subjective financial literacy is by far the best predictor of objective financial literacy. As such, an increase in subjective financial literacy by 1 is associated with a 0.71 increase in our objective quiz-score. Nonetheless, the coefficients of the other variables keep their sign and their significance with the exception of age and income.

Since our financial literacy score is not continuously distributed and its range is constrained between 0 and 8, we also employ an ordered probit regression for the models with and without subjective financial knowledge (see columns 5 and 6). While ordered probit is best suited for the data in principal, there is not much difference between the different regression models with respect to the level of significance for most variables. Hence, the results of the OLS-regressions are robust. The pseudo R^2 is 0.03 if only socioeconomic

[9]Note however, that we measured several of the personal characteristics using a discrete or binary scale which limits the interpretation of the coefficients.

[10]To analyze whether the regression model suffers from multicollinearity we compute variance inflation factors. All factor scores are below the critical threshold of 2.5, indicating a low degree of multicollinearity.

and demographic factors are included as independent variables and increases substantially to 0.07 after taking self-assessed financial knowledge into consideration. Overall, the results show that researchers should use self-assessments of financial competence instead of socioeconomic and demographic variables when they want to proxy financial literacy and an objective measure is missing.

After having analyzed the determinants of financial literacy, we conduct several regressions with BTA as dependent variable. Independent variables capture the set of personal characteristics as well as our objective financial literacy score.[11] Regression results can be seen in Table 5.

Insert Table 5 here

Column 1 reveals that BTA is positively related to gender, the internet dummy, the finance profession dummy, income and wealth but negatively to the education level which confirms the correlation results. The beta coefficients reported in column 2 indicate that the finance profession dummy has again the strongest influence on BTA followed by the distribution channel. Obviously BTA and financial literacy are constructs which are to some extent affected by the same underlying personal characteristics with the exception of education. To analyze whether financial literacy itself has an influence on BTA, it is included in the regression as an independent variable (see columns 3 and 4). As one can infer from the results, there is indeed a positive and highly statistically significant relationship between BTA and financial literacy. Therefore, the correlation found in subsection 3.1 is not spurious. People with higher financial knowledge believe to be able to achieve higher returns on their investments. Also the beta coefficient for financial literacy is 0.12 which is almost as large as the beta coefficient for the finance profession dummy. To check the robustness of the OLS-regressions columns 5 and 6 display the regressions results with and without financial literacy using an ordered probit design. Our findings are qualitatively unchanged.

Throughout this subsection we use the internet dummy as an independent variable to explain the level of financial literacy or BTA. It is not our intention to claim that this

[11] If we run the regressions with self-assessed instead of objective financial literacy as independent variable our results are qualitatively unchanged for the coefficients of the socioeconomic and demographic characteristics.

relationship is causal. In fact, one could easily argue that financial literacy and BTA influence the likelihood to use a direct distribution channel, i.e. assume a reversed causality. Instead, we want to predict the overall level of financial literacy or BTA with a set of personal variables, of which the selected distribution channel is one. However, in Table 6 we test which variables affect the decision to purchase funds online using a probit model. To ease the interpretation of the results, the coefficients are expressed as marginal effects evaluated at the median of the independent variables. For the dummy variables the coefficients represent the probability change for an increase from 0 to 1.

Insert Table 6 here

Table 6 clearly shows that both financial literacy and overconfidence are major determinants of the distribution channel (direct vs. indirect) selected by mutual fund customers. The model predicts that an investor with a financial literacy score of 7 is 6.5% more likely to use an internet channel than an investor with a literacy score of 6. Also, investors with a BTA-level of 4 are 5.5% more likely to choose an internet channel than investors who stated a BTA-level of 3. Obviously, less-knowledgeable and less confident investors tend to seek advice from a broker or financial advisor. The results of the probit regression are consistent with the correlation analysis presented above, which shows that that the internet channel dummy is only weakly correlated with the other variables except financial literacy and BTA.

4 The influence of financial literacy and BTA on overoptimism and miscalibration

The aim of the following section is to test our hypotheses that less financially educated (more overconfident) fund customers are overoptimistic about the past returns of their fund and underestimate the fund's return volatility. As outlined in subsection 2.1, cognitive dissonance might cause people to hold unrealistic beliefs about the return distribution of their fund. We expect that more sophisticated (overconfident) participants are less (more) prone to this kind of overoptimism.

Recall from Table 2 that the mean (median) return estimate and actual return are quite similar. The correlation between return estimates and realized returns is 0.55 ($p<0.01$), indicating that participants are able to give relatively precise estimates on average.[12] Nevertheless, participants might overestimate past fund performance. To analyze whether survey participants actually exhibit a positive bias, we proceed as follows. We create the variable return bias which is the difference of the realized fund return over the last year from the estimated return that subjects stated in B.[13] To infer the accuracy of the return recollections, we take the absolute value of the return bias. Our miscalibration measure with respect to the volatility of the funds and the Dax 30 index is computed as follows: $Miscalibration = ln[Historical\ volatility/Volatility\ Estimate]$.[14] The historical volatility is the one-year volatility estimate based on monthly past returns.[15] The miscalibration measure should be close to 0 for well-calibrated respondents. Note that we use expected volatilities but not expected returns in our computations. This is based on the well-known fact that realized returns are a poor indicator for expected returns, and that the second moment of the return distribution is more stable over time.

The mean (median) return bias in our sample is -0.14% (-0.46%). Hence, no tendency to overestimate past fund returns can be found among the sample participants on average. The mean (median) absolute return bias is 6.65% (4.52%). Our results indicate that the return perceptions are fairly accurate on average. In the following, we consider the influence of financial literacy and overconfidence (BTA) on the past return recollections of our survey participants. Therefore, we regress the return estimate and the absolute return bias on those variables. We include our set of personal characteristics as control variables. In unreported results, we find a strong tendency among subjects to overestimate (underestimate) past fund returns, when past performance was rather low (high). While

[12]This contrasts sharply with Glaser and Weber (2007) who find an insignificant correlation between return estimates and realized returns for a sample of online-broker customers. Note however, that their approach differs from ours. They focus on portfolio performance, whereas we analyze return estimates for single securities.

[13]Recollections are matched with realized returns on a daily basis. Responses were excluded from the following analysis if participants did not hold fund shares any more at the time when they filled out the questionnaire.

[14]Taking the natural logarithm of the dependent variable better satisfies the assumption of a linear relationship between the dependent variable and the independent variables in the regression analysis below.

[15]Return data from April 2001 to April 2007 is used for the computations. We required investment funds to have at least 36 months of return data.

cognitive dissonance can explain why subjects overestimate weak past performance, it is silent on why they attribute lower returns than realized to funds with high past returns. We conclude that the anchoring heuristic provides a better description of the data. When making estimates on the past return of their fund, subjects seem to rely on a reference point, which could be the general stock market return for instance. Although they are on average aware that their fund return was above or below this reference point, adjustments made are insufficient. To control for the influence of the realized return on the accuracy of the return perceptions, we rank all funds based on their realized return in 10 deciles and include decile dummies as control variables in our regression.[16] Results are shown in Table 7). The dependent variable is the past return estimate in column 1 and the absolute return bias in column 2.

Insert Table 7 here

Two interesting results can be inferred from Table 7. First, both financial literacy and BTA have a positive influence on the return estimate. The coefficients are not only statistically but also economically significant. The model predicts that participants with a quiz score of 8 estimate the past return of their fund 2.8% higher compared to the realized return than participants with a quiz score of 0. The difference in the return estimate between subjects with the highest and lowest level of BTA is 4.1%. Other personal characteristics reveal no significant impact on the estimated return. Second, as you can see from column 2, financial literacy is negatively related to the absolute return bias value. This supports the notion that while more sophisticated investors tend to give higher return estimates, their estimates are also more precise. The coefficient is -0.272% which is again statistically significant and of economic importance. However, the BTA coefficient is also negative, but statistically insignificant. Thus, while we find that more financially sophisticated subjects are able to make more accurate return estimates, our hypothesis that BTA exacerbates unrealistic past return recollections cannot be confirmed. BTA-subjects state higher return estimates, but they do not overestimate past performance since their funds' returns were actually higher.

After having investigated the subjects' perceptions about the first moment of the return

[16]This does not alter the results for our variables of interest but improves the overall model fit.

distribution, we now analyze which factors influence the perceived volatility in greater depth. We have already shown in subsection 2.2 that confidence intervals for return boundaries seem to be to narrow on average. Summary statistics for our miscalibration measure lead to the same conclusion. The mean (median) miscalibration is 1.10 (1.12) for the own fund and 1.49 (1.54) for the DAX 30. Obviously, there is no indication that participants underestimated the funds' riskiness to a greater extent than the riskiness of the index. The lower miscalibration level for the own fund is caused by the relatively low historical volatilities of the funds in our sample. To analyze which factors drive the level of volatility misperception, we conduct several regressions with the miscalibration measures as the dependent variables (see Table 8).

Insert Table 8 here

Table 8 points out that subjects with higher literacy scores are not only less prone to misperceive the return volatility for their own fund but also for the DAX 30. The coefficients are of similar size in both regressions and indicate that low financial sophistication is one key driver of volatility underestimation. The other key driver is age. The coefficient is significantly positively related to the level of miscalibration, indicating the especially older investors have problems to correctly assess the riskiness of the stock market and their fund. On the other hand, we find that variables like internet channel, gender and education which are positively correlated with financial literacy have a negative effect on miscalibration. Contrary to our expectations, the coefficient of BTA is insignificant in column 1 and possesses a negative and significant sign in column 2. This implies that investors who view themselves above average in terms of investment skills state more accurate volatility estimates for their own fund. Hence, different manifestations of overconfidence are actually unrelated or even negatively related to each other in our sample.[17] It is possible that investor learning contributes to this finding. In their search for superior investment opportunities, BTA-subjects deal more extensively with their fund choices and thereby become more aware of the riskiness compared to non-BTA-subjects. If we standardize the coefficients, the beta coefficient of BTA is close to 0 indicating that its explanatory power is rather low compared to financial literacy and age, though. Overall, while there is a substantial level of volatility misperception, our results show that more

[17] See also Glaser et al. (2005) who report a similar finding.

sophisticated investors are able to make more realistic risk assessments. The results are robust with respect to the underlying (DAX 30 or own fund) considered. However, the fit of the regression models is rather poor (the R^2's are 0.08 and 0.10 respectively).

Of special interest is the negative relationship between gender and miscalibration. Recall from Table 3 that males are more overconfident in terms of BTA thinking. Hence, gender affects both manifestations of overconfidence in different directions. Using brokerage account data, Barber and Odean (2001) analyze the effect of overconfidence on trading volume. They proxy for overconfidence with gender assuming higher levels of overconfidence for men in the area of finance and find that male investors indeed trade more excessively, thereby reducing their net returns. Barber and Odean (2001) motivate their empirical analysis by theoretical models predicting that overconfident investors will trade more than rational investors. However, overconfidence in these models is usually modeled in terms of miscalibration: overconfident investors overestimate the precision of their private signals and thus underestimate the volatility of securities, i.e. their confidence intervals are too tight (see e.g. Odean (1998)). Our results call into question the empirical validity of these models. Since male investors are actually less miscalibrated, BTA can obviously better explain why higher levels of trading volume are observed among them.

5 Mutual fund expenses, financial literacy and BTA

5.1 Bivariate analysis

In this section we examine how financial literacy is related to mutual fund expenses. Basically, two research questions are of interest. The first question is whether more sophisticated subjects are more aware of fund expenses. The second question is whether they also recognize the importance of mutual fund fees and act accordingly, i.e. buy funds with lower front-end loads and management fees.

To get a first impression about the influence of financial literacy, we split the sample based on the subjects' literacy score in 2 roughly equal-sized parts. Those having a quiz score below 7 (= median) are assumed to have a low financial literacy. We distinguish between participants revealing low and high levels of financial competence and examine

group differences with respect to load payments and management fees. Table 9 presents the results. The impact of financial literacy on sales loads is assessed using 3 variables: the load estimate obtained from part B of the questionnaire, the load discount and the fraction of participants who are unaware of their latest load payment. The load discount is constructed by subtracting the load estimate from the regular front-end load. Regarding management fees, we test for differences in management fee estimates and actual management fees. Actual fees can also be investigated since fee charges are unique for each fund class. Hence, in contrast to front-end loads, we are able to examine whether our results are driven by systematical distortions in subjects' responses with respect to this type of expense.

Insert Table 9 here

Subjects who belong to the high financial literacy group stated significantly lower load payments for their latest fund purchase. The mean (median) difference is -0.51% (-1.50%). The differences are significant at the 1%-level. They could be due to the fact that more financial literate respondents buy either funds with lower regular load charges like index funds or that they buy the same funds at higher discounts. We therefore analyze the load discount: mean and median group differences are positive and significant ($p<0.01$), though somewhat smaller in absolute value. This finding suggests that a substantial fraction of the differences in the load payments can be explained with more financially literate respondents enjoying higher discounts. The positive correlation between financial literacy and the internet channel dummy (see subsection 3.1) might be responsible for this finding. Since front-end loads can differ among investors even for the same fund, there is no possibility to assess the correctness of the load estimates. Thus, more sophisticated investors could just underestimate their load payments to a greater extent. However, approximately 14% of the investors belonging to the low financial literacy group refused to state their latest load payment, while only 6% of the respondents in the second group were unable to provide an estimate. The difference implies that rather less financially educated subjects may have difficulties to recall their load payment.

After having found that more sophisticated participants seem to be keen in selecting funds with low front-end loads, we now assess whether there is also a negative relationship

between financial literacy and the fund's management fees. Table 9 shows that investors with lower literacy scores have a minor tendency to underestimate management fees. The mean fee estimate is 1.34% while the mean actual fee is 1.39% for the first group. In contrast, the estimates of the respondents within the high financial literacy group are very precise. There is only a slight and economically insignificant difference in the actual management fees paid between the two groups. The mean difference is -0.04% ($p<0.05$) and the median difference is 0.00% ($p=0.44$). While sophisticated investors are aware of the amount charged by the fund management, they do not invest more heavily in funds with low fees. This finding is surprising and requires further evaluation in the following subsection.

5.2 Regression analysis

We first present evidence on how financial literacy is related to mutual fund loads in the multivariate analysis. Table 10 illustrates which factors influence the amount of the front-end load paid (columns 1, 2, 5 and 6) and the load discount obtained (columns 3, and 4). We employ OLS and tobit regressions for the front end load paid as dependent variable. In the tobit design, the regressand is left-censored at 0 since sales loads are strictly positive. While this slightly changes the coefficient values (and for a correct interpretation of their size one has to consider the tobit specification) their statistical significance does not depend on the regression type. In contrast to previous research, we are interested in personal characteristics that can explain the sales load paid, i.e. which investors put more weight on load payments, and not in fund characteristics that have an influence on the load. However, for the sake of completeness we also regress the front end load on fund characteristics (column 7) and report the results of a complete design with personal characteristics and fund characteristics as explanatory variables (column 8).

Insert Table 10 here

As one can infer from column 1, several of the personal variables turn out to have a negative and significant impact on the load payment: higher levels of financial literacy, BTA and education are associated with lower sales loads. The coefficient of the internet dummy is significantly negative as well which is not surprising. The same variables can

be associated with higher load discounts (column 3). Overall, more financially literate subjects seem to put a higher emphasis on funds that charge low loads respectively are offered at higher discounts. Also, the lower load payment cannot solely be explained with more sophisticated investors purchasing funds online. A possible explanation for our findings could be that more financially sophisticated investors were more likely to state a balanced fund or index fund/ETF as latest fund purchase, which charge lower sales than actively managed stock funds. We therefore repeat the baseline regressions excluding all balanced and passive funds (see columns 2, 4). Our results are unchanged in that case. Hence, the negative relationship between financial literacy and the load payment is not the result of more financially literate individuals buying types of funds with lower loads in general.

In the models 1 to 4 the personal characteristics can explain between 7% and 9% of the variance of the dependent variables. The R^2 increases to 0.15 if we try to explain the funds' load with several fund characteristics including its type (index fund vs. actively managed fund; stock fund vs. balanced fund), fund age and the fund family (see column 7).[18] Nevertheless, it is interesting that personal characteristics are able to explain the load at all. As you can see from column 8, this additional explanatory power does not vanish if we use both personal and fund characteristics as independent variables.

Next it is analyzed whether a relationship between the funds' management fees and certain investor characteristics can be established as well. In Table 11 we present the results of the regressions using the management fee stated by the participants, as well as the actual management fee. We conduct the same regressions as in the case of the front-end load. However, the coefficient values are almost identical in the tobit and the OLS design because only very few (around 30) observations are left censored. Consequently, only the results of the OLS regressions are reported.

Insert Table 11 here

The major difference compared to the previous regression is that personal characteristics including financial literacy do a very poor job in explaining the fund's management fee.

[18] The reduction in the number of observations is due to the fact that several participants stated the same fund as their latest fund purchase. In column 7 each fund is treated as 1 observation.

Looking at column 1, the only variable that has a significant and negative impact on the management fee stated by the respondents is gender ($p<0.01$). The model fit is extremely poor (R^2=0.0032). It is even not possible to reject the null that all variables are jointly insignificant (F=1.24; p=0.26). Column 2 shows that our results results are very similar with regard to the regressand chosen (fee estimate vs. actual fee). However, if actual fees are considered the BTA coefficient is significantly positive($p<0.01$), indicating a systematical underestimation of the funds' fee charges by overconfident subjects. Overall, the multivariate analysis confirms our bivariate results. We neither find a relationship between financial literacy and the actual/estimated management fee of the fund stated, nor does any other personal variable have a robust effect.

In column 5, we regress the actual management fee on fund characteristics. As it was to be expected, the coefficient of the index fund/ETF dummy and of the balanced fund dummy are significantly negative. The R^2 of the model is 0.35 which is mainly due to the fact that among actively managed funds the fund affiliation can explain variations in the management fees to a substantial amount, i.e. funds of the same family usually have the same or a similar management fee.

While fund characteristics do reasonably well in explaining the fund's management fee, the poor explanatory power of the financial literacy measure and the various other socioeconomic and demographic characteristics is remarkable. Clearly, long-term investors should put more emphasis on operating expenses like management fees than on front-end loads. Our finding is not driven by an absence of dispersion in the funds' management fees. On the contrary, fee charges vary substantially even among actively managed stock funds. The lowest fee is 0.7% and the highest fee is 2.1% among these funds in our sample. Also, there is an economically significant spread of 0.74% in the mean fund fee between the cheapest and the most expensive fund company, once again excluding all balanced funds and index funds/ETF. Hence, participants have the choice to select funds with low management fees. Ongoing expenses such as management fees are obviously of minor importance in the purchasing decision, no matter whether fund customers are financially literate or not.

Our results are in line with the argument provided by Barber et al. (2005) who analyze the development of fund expenses for the U.S. over time. While the mean front-end

load charged by equity funds dropped by more than half, operating expense ratios increased steadily by more than 60% on average. According to Barber et al. (2005) investor inattention to ongoing expenses is the most plausible explanation for the change in the fee structure. They content that investors are more sensitive to salient charges like sales loads and have learned to avoid them. In contrast, investors are less mindful of operating expenses maybe because they are less transparent. Provisions are made for operating expenses which reduce the fund's NAV. And since these provisions are accumulated on a daily basis, their increase over time is masked by the fund's return volatility. The hidden character of management fees might therefore cause fund customers to underestimate their importance.

Although a potential disregard of operating expenses among mutual fund investors might explain the lack of significance observed in Table 11, there is an important difference between front end loads and management fees. After having made the decision to buy a certain fund, the management fee is determined while the load payment is still discretionary to some extent. Fund customers can choose a direct distribution channel, negotiate with their bank advisor or acquire the shares of the fund via the stock exchange, for instance. Thus, our findings could indicate that fund expenses, no matter whether loads or management fees, are only of second order importance. People first select their favorite fund based on non-cost criteria. In the next step, financially sophisticated customers try to minimize their expenses which is solely possible for the load payment.

6 Financial literacy, BTA and the decision to select an actively managed fund

This section analyzes to what extent financial illiteracy and BTA can explain the strong reliance on actively managed funds. To address this question we examine how our financial literacy and BTA measures are related to the likelihood of stating an actively managed fund in the questionnaire. As mentioned above, there are reasons to believe that unsophisticated investors are less likely to buy passive funds. First of all, knowledge about index funds and ETF is less widespread among this group. Secondly, these investors are more likely to purchase funds through intermediate channels, thereby relying on financial

advisors who have no interest to recommend passive products. We suppose that BTA is negatively related to the probability of choosing a passive fund, because subjects who believe to have superior picking abilities tend to prefer active management.

We start our analysis with a 2x2 frequency Table based on the level of financial sophistication and BTA (see Table 12). Participants are sorted in the low (high) financial literacy group if their quiz score is below (equal to or above) 7. Likewise, we assign participants who state a BTA score above (below or equal to) 3 to the high (low) BTA group.

Insert Table 12 here

Panel A of Table 12 reveals that for 10.1% of all participants within the high financial literacy group, the latest fund purchased is a passive fund. Among those who display a low level of financial sophistication, only 4.6% state a passive fund. The difference is statistically significant ($p<0.01$). Additionally, subjects who are not overconfident are more likely to choose a passive fund than BTA subjects (8.1% vs. 6.3%; $p<0.1$). With respect to the subgroups, the fraction of passive funds ranges between 3.5% for the high BTA/low financial literacy group and 11.0% for the low BTA/high financial literacy group. These findings support our hypotheses. Recall from subsection 5.2 that BTA and financial literacy are positively related. This is confirmed by a χ^2-independence test for the 2x2 frequency Table ($\chi^2=23.98$; $p<0.01$). Hence, the positive influence of financial literacy on the probability of selecting an index fund or ETF is partly offset by higher levels of BTA among more financially literate subjects.

To assess whether the lower fraction of passive fund purchases among less sophisticated and overconfident subjects is caused by a lack of knowledge, panel B of Table 12 displays the number of respondents who are aware of index funds or ETF among subgroups. As you can see, 65% of the low financial literacy group members are familiar with passive funds, whereas 90% of high financial literacy group know them ($p<0.01$). Hence, a lack of awareness can at least partly explain the difference in the reliance on passive funds for both groups. In contrast, overconfident participants actually have a higher knowledge about passive funds (84.5% vs. 75.3%; $p<0.01$). Hence, a lack of knowledge can not explain why these subjects are more likely to buy active funds.

Next, we employ a probit model in which the dependent variable takes the value of 1 if the participant states an index fund or ETF as latest fund purchase. We take the level of financial literacy, the BTA measure and the various socioeconomic and demographic characteristics which we collected as independent variables. Table 13 displays our results. The coefficients are expressed as marginal effects at the medians of the independent variables.

Insert Table 13 here

In accordance with our presumption, we find a significant negative impact of BTA on the decision to select a passive fund in column 1. Financial literacy is positively related to the dependent variable implying that more financially sophisticated subjects are indeed more likely to choose an index fund or ETF. The effects are rather minor though. While an increase in the financial literacy score from 7 to 8 results in a 2.1% higher probability of choosing an index fund or ETF, a change in the BTA level from 3 to 4 reduces the probability of selecting a passive fund by 1.5%. A statistically significant relationship can also be found for the residence, internet, education and wealth variables. The coefficient of the internet channel dummy reveals a 6.5% higher probability of buying an index fund or ETF in an online channel. Obviously, passive funds are less frequently sold via traditional distribution channels. The significance of the residence variable could be a consequence of higher banking competition in cities.

So far we have assumed that all independent variables are exogenously given. As previously shown, there is however a strong and robust contemporaneous relationship between BTA and FL. If one believes in the causality of this relationship (which we cannot prove), there are two channels through which FL affects the probability of relying on passive funds: a positive and direct link between financial literacy and the likelihood to buy a passive fund and an indirect negative link via BTA. To obtain an estimate for the overall effect of financial literacy on the likelihood to select a passive fund, we proceed as follows. We regress BTA on the financial literacy score and the personal characteristics, that is we repeat the regression of subsection 3.2. We take the residual BTA score, i.e. the level of the participants' BTA which is neither explained by financial literacy nor other individual variables. Instead of BTA the residual is included in the above presented probit model. Results can be inferred from column 2 of Table 13. As you can see, the coefficient of FL

decreases in that case. However, the effect is marginal. Still, a change in the FL score by 1 results in a 2.0% higher probability of choosing a passive fund. Thus, the indirect negative link can only modestly explain why higher levels of financial literacy are not stronger associated with passive funds.

7 Summary, discussion and conclusion

Based on an online survey with 3,228 participants it was our main goal to investigate in detail the consequences of financial literacy in the context of mutual fund investments. In particular, we examined whether a lack of financial literacy among fund customers can explain the popularity of actively managed funds, despite their high expenses. We present evidence that financial literacy indeed improves the accuracy of past return recollections and leads to more realistic volatility assessments. Moreover, participants that are financially literate pay lower front-end loads indicating that these investors are aware of the deadweight cost character of sales loads. With respect to management fees, we find no impact of financial literacy though. This holds for other personal characteristics as well. While participants made relatively precise statements concerning the management fee of their fund, our results suggest that they do not care about them in their investment decision.

Although more financially literate participants are indeed more likely to buy passive funds the relationship is relatively weak. Overconfidence, i.e. the believe to be better than average in identifying investments that generate superior returns, prevents subjects from investing in passive funds. Also, there is a positive relationship between financial literacy and overconfidence indicating that higher levels of financial literacy are not universally positive.

Our results are consistent with the view that 2 distinct groups of actively managed fund customers exist. The first group is made up of relatively unsophisticated fund buyers and the second group consists of sophisticated investors who believe that they have some fund selection ability. Less-knowledgeable fund customers mainly choose traditional distribution channels, implying that they seek assistance from a financial advisor who has an incentive to recommend actively managed funds. In contrast, more-knowledgeable fund

customers select their funds more often on their own and rely more on internet channels thereby avoiding sales commissions.

In our view, further research is warranted to analyze how the fund industry segments its customers and based on which criteria. Perhaps funds with different fee structures are actively promoted to different clientele. For researchers and policy makers alike, it is also important to find out whether the industry actively exploits the disregard of annual expenses by most customers, e.g. by shifting a portion of the sales loads to annual kick back payments. Some researchers have started to assess the value added by brokers in the mutual fund industry (see Bergstresser et al. (2006)), but further clarification is needed. Moreover, policy makers should discuss ways to present the importance of operating expenses especially to less-knowledgeable customers. Once invested in a fund, it is very likely that these customers are "locked in". Without recognizing the importance of those expenses, mutual fund customers will not change their investment behavior, even though kick back payments and other hidden costs have to be disclosed meanwhile according to the Markets in Financial Instruments Directive (MiFID) by the European Parliament and the European Council (2004 and 2006). From the perspective of the mutual fund business, market research should analyze how different fee structures influence the flow of money into funds. In particular, no research has been conducted on the effect of revenue sharing agreements yet.

Appendix: Financial Literacy Statements

This table presents the statements which subjects were given to assess financial literacy along with the percentages of correct, false and don't-know responses. Correct responses are used to construct the Financial Literacy Score.

	Percentages of responses		
Statement	Correct	False	N.A.
Short-selling a stock means that the stock is sold without actually owning it.	68.93%	9.98%	21.10%
Assuming efficient stock markets, it is not possible to beat the market.	48.17%	30.42%	21.41%
Dividends are additional payments to the management of a company.	96.56%	1.02%	2.42%
The abbreviation IPO refers to a financial regulatory authority which supervises the placement of securities at a stock exchange.	63.91%	11.93%	24.16%
The Japanese stock index is called Hang-Seng Index.	79.15%	9.70%	11.15%
The compounded-interest-effect occurs if the lending rate is larger than the borrowing rate.	87.08%	5.39%	7.53%
If one raises a mortgage or a loan, one should rather take the nominal interest rate than the effective rate of interest into account because the former indicates the actual credit costs.	86.49%	7.00%	6.51%
Creditworthiness describes the ability to pay interests on a raised loan and to redeem the loan.	86.59%	9.20%	4.21%
Mean	77.11%	10.58%	12.31%

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Table 1: Description of variables

This table describes the measurement of the variables used in the data analyses below. Data on mutual fund investors was gathered from an internet survey, data on mutual funds is from Datastream and OnVista.

	Panel A: Survey Data	
Variable	**Description**	**Questionnaire Part**
Subjective FL	Self-assessed financial knowledge on a 5-point Likert scale with 1 (5) indicating a low (excellent) level of financial knowledge	A
BTA	Measurement of one's belief to be BTA in the investment domain on a 5-point Likert scale with 1 (5) indicating a strong belief to make worse (better) than average investment decisions than the typical investor	A
Internet Channel	Indicator variable taking the value of 0 (1) for investors purchasing their funds via a traditional (online) distribution channel	B
Past Return Estimate	Net return estimate over the last 12 months for the latest stock (balanced) fund purchased in %	B
Load Paid Estimate	Estimated front-end load payment for the latest stock (balanced) fund purchased in %	B
Management Fee Estimate	Estimated current management fee of the latest stock (balanced) fund purchased in %	B
Return Forecast Dax	Participants' expected return of the DAX 30 in % over the next year using the Pearson and Tukey estimator (see section 2 for a detailed description)	C
Return Forecast Own Fund	Participants' expected return of the fund stated in part B in % over the next year using the Pearson and Tukey estimator	C
Volatility Forecast Dax	Participants' expected volatility of the DAX 30 in % over the next year using the Pearson and Tukey estimator	C
Volatility Forecast Own Fund	Participants' expected volatility of the fund stated in part B in % over the next year using the Pearson and Tukey estimator	C
Passive fund knowledge	Indicator variable taking the value of 1 (0) if the participant is (not) aware of index funds or ETF	D
FL Score	Objective measure of financial literacy using 8 quiz-like statements (see Appendix)	D
Gender	Indicator variable taking the value of 0 (1) for female (male) subjects	D
Age	Subjects age in years	D
Residence	Indicator variable taking the value of 0 (1) for subjects living in areas with less (more) than 50,000 inhabitans	D
Finance Profession	Indicator variable taking the value of 1 for subjects working in the financial services industry and 0 otherwise	D
Education	Categorial variable ranging from 1 to 6 indicating the highest educational achievement	D
Income	Indicator variable taking the value of 0 (1) for subjects earning less (more) than EUR 100,000	D
Wealth	Indicator variable taking the value of 0 (1) indicating a total household wealth (including real estate property) below (above) EUR 250,000	D

	Panel B: Fund Data	
Variable	**Description**	**Datasource**
Past Return Realized	Net return realized over the last 12 months for the latest stock (balanced) fund purchased in %	Datastream
Regular Load	Regular front-end load payment for the latest stock (balanced) fund purchased in %	OnVista
Management Fee	Current management fee for the latest stock (balanced) fund purchased in %	OnVista

Table 2: Summary Statistics

This table reports summary statistics for all variables used in the data analyses below. Data on mutual fund investors was gathered from an internet survey, data on mutual funds from Datastream and OnVista.

		Panel A: Survey Data				
Variable	**N**	**mean**	**p50**	**sd**	**min**	**max**
Subjective FL	3086	3.57	4	0.80	1	5
BTA	3086	3.10	3	0.96	1	5
Internet Channel	3001	0.48	0	0.50	0	1
Past Return Estimate	2406	16.14	15	11.16	-5	62
Load Paid Estimate	2632	1.99	2	1.97	0	5.5
Management Fee Estimate	2134	1.35	1.5	0.60	0	4
Return Forecast Dax	3086	10.04	8.6	9.13	-6	71.4
Return Forecast Own Fund	2625	11.51	10	7.98	-1.5	50
Volatility Forecast Dax	3086	7.10	5.09	6.12	0.39	34.94
Volatility Forecast Own Fund	2625	7.13	5.04	6.38	0.39	34.94
Passive fund knowledge	3086	0.78	1	0.41	0	1
FL Score	3086	6.29	7	1.39	0	8
Gender	3086	0.90	1	0.29	0	1
Age	3086	41.50	39	14.42	18	95
Residence	3002	0.59	1	0.49	0	1
Finance Profession	3086	0.16	0	0.37	0	1
Education	3086	4.68	5	0.99	1	6
Income	3086	0.21	0	0.40	0	1
Wealth	3086	0.43	0	0.49	0	1

		Panel B: Fund Data				
Variable	**N**	**mean**	**p50**	**sd**	**min**	**max**
Regular Load	2554	4.40	5	1.48	0	10
Management Fee	2478	1.36	1.5	0.38	0.19	2.10
Past Return Realized	2392	15.85	15.29	9.83	-9.52	57.93

Table 3: Correlation Results

This table reports Person correlation coefficients for the Financial Literacy Score, BTA and a number of socioeconomic and demographic variables. See Table 1 for a description of the variables. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) FL Score	1										
(2) Subjective FL	0.41***	1									
(3) BTA	0.19***	0.43***	1								
(4) Gender	0.13***	0.13***	0.10***	1							
(5) Internet Channel	0.13***	0.13***	0.15***	0.05***	1						
(6) Residence	0.00	-0.01	-0.04**	0.00	0.00	1					
(7) Finance Profession	0.16***	0.32***	0.16***	0.00	0.03*	-0.03*	1				
(8) Income	0.10***	0.12***	0.09***	-0.01	0.02	0.00	0.03*	1			
(9) Wealth	0.08***	0.06***	0.09***	0.01	-0.01	-0.13***	-0.08***	0.32***	1		
(10) Education	0.15***	0.05***	-0.03	0.02	0.08***	0.13***	-0.06***	0.16***	0.02	1	
(11) Age	0.01	-0.03*	0.00	-0.05***	0.01	-0.11***	-0.17***	0.12***	0.48***	0.07***	1

Table 4: Determinants of Financial Literacy

This table presents the results of regressing financial literacy as measured by the objective Financial Literacy Score on BTA, self-assessed financial knowledge, socioeconomic and demographic variables. We report regression coefficients for ordinary least squares and ordered probit. Standard errors are in parentheses. Columns 2 and 4 present the beta coefficients for the OLS regressions in columns 1 and 3. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Dependent Variable	**Financial Literacy Score**					
Model	**OLS**	**OLS**	**OLS**	**OLS**	**Oprobit**	**Oprobit**
Coefficients		**Beta**		**Beta**		
Subjective FL			0.717***	0.381		0.581***
			(0.035)			(0.031)
Gender	0.587***	0.126	0.376***	0.081	0.445***	0.305***
	(0.083)		(0.078)		(0.066)	(0.066)
Internet Channel	0.0862***	0.114	0.0327**	0.043	0.0707***	0.0321***
	(0.014)		(0.013)		(0.011)	(0.011)
Residence	-0.0231	-0.008	-0.00973	-0.004	-0.0136	-0.00424
	(0.05)		(0.047)		(0.04)	(0.04)
Finance Profession	0.607***	0.165	0.142**	0.039	0.473***	0.128**
	(0.067)		(0.066)		(0.055)	(0.058)
Income	0.147**	0.044	0.0869	0.026	0.141***	0.101*
	(0.064)		(0.06)		(0.052)	(0.052)
Wealth	0.268***	0.097	0.162***	0.059	0.214***	0.142***
	(0.059)		(0.055)		(0.047)	(0.048)
Education	0.173***	0.122	0.146***	0.103	0.121***	0.107***
	(0.026)		(0.024)		(0.021)	(0.021)
Age	-0.00355*	-0.037	0.000944	0.010	-0.00294*	0.000487
	(0.002)		(0.0019)		(0.0016)	(0.0016)
Constant	4.521***	.	2.444***	.	.	.
	(0.17)		(0.19)			
Observations	2920		2920		2920	2920
(Pseudo) R2	0.09		0.21		0.03	0.07

Table 5: Determinants of overconfidence (BTA)

This table presents the results of regressing BTA (better than average) on Financial Literacy Score, socioeconomic and demographic variables. We report regression coefficients for ordinary least squares and ordered probit. Standard errors are in parentheses. Columns 2 and 4 present the beta coefficients for the OLS regressions in columns 1 and 3. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Dependent Variable			**BTA**			
Model	**OLS**	**OLS**	**OLS**	**OLS**	**Oprobit**	**Oprobit**
Coefficients		**Beta**		**Beta**		
Financial Literacy Score			0.0820***	0.120		0.0983***
			(0.013)			(0.015)
Gender	0.273***	0.086	0.228***	0.072	0.323***	0.273***
	(0.057)		(0.057)		(0.068)	(0.068)
Internet Channel	0.217***	0.116	0.178***	0.096	0.261***	0.218***
	(0.034)		(0.034)		(0.04)	(0.041)
Residence	-0.0394	-0.021	-0.0377	-0.020	-0.0478	-0.0462
	(0.035)		(0.034)		(0.041)	(0.041)
Finance Profession	0.408***	0.162	0.356***	0.142	0.481***	0.422***
	(0.046)		(0.047)		(0.055)	(0.056)
Income	0.144***	0.063	0.132***	0.057	0.167***	0.153***
	(0.044)		(0.044)		(0.052)	(0.052)
Wealth	0.166***	0.088	0.143***	0.076	0.196***	0.170***
	(0.041)		(0.041)		(0.048)	(0.048)
Education	-0.0494***	-0.051	-0.0625***	-0.064	-0.0557***	-0.0717***
	(0.018)		(0.018)		(0.021)	(0.021)
Age	-0.00198	-0.030	-0.00178	-0.027	-0.00225	-0.00202
	(0.0014)		(0.0014)		(0.0016)	(0.0016)
Constant	2.945***	.	2.559***	.	.	.
	(0.11)		(0.13)			
Observations	2920		2920		2920	2920
(Pseudo) R2	0.06		0.08		0.03	0.04

Table 6: Determinants of the Distribution Channel

This table presents the results of a probit model with Internet Channel as dependent variable and the Financial Literacy Score, BTA, socioeconomic and demographic variables as regressors. Internet Channel is a dummy variable taking the value of 0 (1) for investors purchasing their funds via a traditional (online) distribution channel. Coefficients are expressed as marginal effects at the medians of the independent variables. Standard errors are in parentheses. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Dependent Variable	**Internet Channel**
Model	**Probit**
Financial Literacy Score	0.065***
	(0.00714)
BTA	0.055***
	(0.01036)
Gender	0.099***
	(0.03342)
Residence	-0.0062
	(0.01906)
Finance Profession	-0.092***
	(0.02656)
Income	-0.007
	(0.02462)
Wealth	-0.057**
	(0.02295)
Education	0.046***
	(0.01006)
Age	-0.0012
	(0.00076)
Observations	2920
Pseudo R2	0.05

Table 7: Determinants of biased past return estimates

This table presents the results of regressing the return estimate and the absolute value of the return bias on the Financial Literacy Score, BTA, socioeconomic and demographic variables. The return bias is computed by subtracting the realized fund return over the last year from the respondent's return estimate. We report regression coefficients for ordinary least squares. Standard errors are in parentheses. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Dependent Variable	**Past Return Estimate**	**Absolute Return Bias**
Model	**OLS**	**OLS**
Financial Literacy Score	0.352**	-0.267**
	(0.17)	(0.13)
BTA	1.035***	-0.283
	(0.24)	(0.18)
Gender	1.246	-0.159
	(0.76)	(0.58)
Internet Channel	0.614	-0.885***
	(0.42)	(0.32)
Residence	-0.465	-0.153
	(0.43)	(0.32)
Finance Profession	-0.0561	-0.448
	(0.57)	(0.44)
Income	0.744	0.424
	(0.54)	(0.41)
Wealth	-0.168	0.0369
	(0.51)	(0.39)
Education	-0.0547	-0.209
	(0.23)	(0.17)
Age	-0.00891	0.0189
	(0.018)	(0.013)
Past Return Decile Dummys	YES	YES
Constant	9.287***	8.980***
	(1.96)	(1.49)
Observations	1973	1973
R2	0.28	0.08

Table 8: Determinants of Miscalibration

This table presents the results of regressing Miscalibration on the Financial Literacy Score, BTA, socioeconomic and demographic variables. Miscalibration is computed as follows: $Miscalibration = ln[Historical\ volatility/Volatility\ Estimate]$. We report regression coefficients for ordinary least squares. Standard errors are in parentheses. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Dependent Variable	**Miscalibration DAX 30**	**Miscalibration Investment Fund**
Model	**OLS**	**OLS**
Financial Literacy Score	-0.0787***	-0.0857***
	(0.011)	(0.013)
BTA	-0.0127	-0.0411**
	(0.015)	(0.019)
Gender	-0.0908*	-0.105*
	(0.047)	(0.06)
Internet Channel	-0.115***	-0.181***
	(0.028)	(0.034)
Residence	-0.0449	-0.0932***
	(0.028)	(0.034)
Finance Profession	0.0267	-0.00806
	(0.038)	(0.046)
Income	0.0437	0.0289
	(0.036)	(0.043)
Wealth	-0.0871***	-0.101**
	(0.033)	(0.041)
Education	-0.0629***	-0.0497***
	(0.015)	(0.018)
Age	0.0114***	0.0129***
	(0.0011)	(0.0014)
Constant	2.034***	1.748***
	(0.11)	(0.15)
Observations	2897	2216
R2	0.08	0.10

Table 9: Financial Literacy and mutual fund expenses

This table examines how financial literacy is related to front-end load payments and management fees. See subsection 5.1 for further details on the variables. Based on the Financial Literacy Score the sample is divided in 2 groups. Participants who achieved a total score value of less than or equal to 6 are assigned to the "low financial literacy group", those who scored above 6 are assigned to the "high financial literacy group". We report absolute values as well as mean (median) group differences. Significance of means (medians) is assessed using a two-tailed t-test (K-sample test). Standard errors are in parentheses. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

	Low FL (≤ 6)		**High FL** (≥ 7)			
No. Participants	**1466**		**1620**		**Difference**	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**
Load Paid Estimate	2.28%	2.50%	1.77%	1.00%	-0.51%***	-1.5%***
Load Discount	2.03%	2.26%	2.47%	2.50%	0.44%***	0.25%***
No Knowledge of Load Paid	14.46%	/	6.23%	/	-8.23%***	
Management Fee Estimate	1.34%	1.50%	1.35%	1.50%	0.01%	0%
Management Fee	1.39%	1.50%	1.34%	1.50%	-0.04%***	0%

Table 10: Determinants of Load Paid

This table presents the results of regressing the Load Paid respectively the Load Discount on Financial Literacy Score, BTA and a set of socioeconomic and demographic variables. Balanced fund and index fund/ETF purchases are excluded in columns 2 and 4. Standard errors are in parentheses. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Dependent Variable	**Load Paid**	**Load Paid**	**Load Discount**	**Load Discount**	**Load Paid**	**Load Paid**	**Load Paid**	**Load Paid**
Model	**OLS**	**OLS**	**OLS**	**OLS**	**Tobit**	**Tobit**	**OLS**	**OLS**
Financial Literacy Score	-0.0910***	-0.0913***	0.0845**	0.0901**	-0.144***	-0.137***		-0.0762**
	(0.028)	(0.034)	(0.035)	(0.039)	(0.041)	(0.048)		(0.03)
BTA	-0.0903**	-0.125***	0.172***	0.181***	-0.155***	-0.202***		-0.0574
	(0.04)	(0.047)	(0.049)	(0.054)	(0.058)	(0.068)		(0.042)
Gender	-0.192	-0.0616	0.049	0.00416	-0.301*	-0.104		-0.142
	(0.12)	(0.15)	(0.16)	(0.17)	(0.18)	(0.21)		(0.13)
Internet Channel	-1.011***	-0.987***	1.007***	1.092***	-1.492***	-1.406***		-0.825***
	(0.072)	(0.086)	(0.088)	(0.098)	(0.11)	(0.12)		(0.077)
Residence	-0.0497	-0.041	0.0403	0.122	-0.0539	-0.0562		0.0354
	(0.073)	(0.086)	(0.089)	(0.098)	(0.11)	(0.12)		(0.075)
Finance Profession	-0.0267	-0.0341	0.0185	-0.00102	-0.116	-0.0996		-0.0738
	(0.099)	(0.11)	(0.12)	(0.13)	(0.15)	(0.17)		(0.1)
Income	-0.0465	-0.0379	0.0804	0.0859	0.00639	0.0275		-0.102
	(0.093)	(0.11)	(0.11)	(0.13)	(0.14)	(0.16)		(0.096)
Wealth	-0.121	-0.139	0.116	0.173	-0.194	-0.22		-0.0463
	(0.086)	(0.1)	(0.11)	(0.12)	(0.13)	(0.15)		(0.09)
Education	-0.101***	-0.0691	0.106**	0.121**	-0.153***	-0.1		-0.056
	(0.038)	(0.045)	(0.047)	(0.051)	(0.056)	(0.064)		(0.04)
Age	0.00144	0.00304	-0.00279	-0.00613	0.00167	0.00419		0.00173
	(0.0029)	(0.0034)	(0.0036)	(0.0039)	(0.0043)	(0.0049)		(0.003)
Indexfunds/ETF-Dummy							-0.936**	-0.839***
							(0.36)	(0.24)
Balanced Fund-Dummy							0.517	0.0497
							(0.57)	(0.5)
Fund age							0.235***	0.182***
							(0.071)	(0.035)
Fund Company Dummys							YES	YES
Constant	4.166***	4.058***	0.166	0.217	4.713***	4.444***	1.824	2.823***
	(0.3)	(0.36)	(0.37)	(0.41)	(0.43)	(0.51)	(1.31)	(1.07)
Observations	2848	2063	2487	2063	2848	2063	603	2402
(Pseudo) R2	0.09	0.08	0.07	0.09	0.03	0.03	0.17	0.21

Table 11: Determinants of Management Fee

This table presents the results of regressing the Management Fee Estimate respectively the Actual Management Fee on Financial Literacy Score, BTA and a set of socioeconomic and demographic variables. Balanced fund and index fund/ETF purchases are excluded in columns 2 and 4. Standard errors are in parentheses. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Dependent Variable	**MF Estimate**	**MF Estimate**	**Actual MF**	**Actual MF**	**Actual MF**	**Actual MF**
Model	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**	**OLS**
Financial Literacy Score	0.0005	0.0142	-0.0100	0.00237		0.000375
	(0.011)	(0.012)	(0.0061)	(0.0043)		(0.0043)
BTA	-0.00791	-0.0397***	0.0312***	0.0129**		0.00974
	(0.015)	(0.015)	(0.0086)	(0.006)		(0.0061)
Gender	-0.0954*	-0.0754	-0.0604**	-0.0372**		-0.0393**
	(0.049)	(0.051)	(0.027)	(0.019)		(0.019)
Internet Channel	-0.0143	0.0313	-0.0217	0.0148		-0.00501
	(0.027)	(0.027)	(0.015)	(0.011)		(0.011)
Residence	-0.021	-0.0084	-0.029	0.00292		-0.0135
	(0.027)	(0.027)	(0.016)	(0.011)		(0.011)
Finance Profession	0.00705	-0.0131	0.0112	-0.00731		0.00116
	(0.035)	(0.035)	(0.021)	(0.015)		(0.015)
Income	0.0198	0.00225	0.00952	0.00769		-0.0105
	(0.034)	(0.035)	(0.02)	(0.014)		(0.014)
Wealth	-0.015	-0.00923	-0.0304	-0.0134		-0.00316
	(0.032)	(0.033)	(0.019)	(0.013)		(0.013)
Education	-0.0109	-0.00695	-0.0121	-0.00323		-0.00197
	(0.014)	(0.015)	(0.0082)	(0.0058)		(0.0058)
Age	0.000142	-0.000266	0.000425	0.000645		0.000555
	(0.0011)	(0.0011)	(0.00062)	(0.00044)		(0.00044)
Indexfunds/ETF-Dummy					-0.646***	-0.503***
					(0.072)	(0.035)
Balanced Fund-Dummy					-0.258**	-0.283***
					(0.11)	(0.07)
Fund age					-0.0270*	-0.0296***
					(0.014)	(0.0051)
Fund Company Dummys					YES	YES
Constant	1.532***	1.589***	1.471***	1.400***	1.934***	0.956***
	(0.12)	(0.12)	(0.065)	(0.046)	(0.25)	(0.092)
Observations	2074	1514	2422	2002	595	2386
R2	0.00	0.01	0.02	0.01	0.36	0.53

Table 12: Bivariate analysis of index fund or ETF choice

Panel A of this table presents the fraction of index funds or exchange traded funds among the funds purchased by subgroups of respondents. Panel B displays the number of sample subjects in % who are aware of index funds or ETF. The sample is divided into 4 parts based on the Financial Literacy Score and BTA. Participants who achieved a total Financial Literacy Score of less than or equal to 6 are assigned to the "low financial literacy group", those who scored above 6 are assigned to the "high financial literacy group". Participants with a BTA level of less than or equal to 3 are assigned to the "low BTA group", those who stated above 3 are assigned to the "high BTA group". Sub-group sizes are in parentheses.

	Panel A: Fraction of Index Funds		
(No. of subjects)	Low FL (≤ 6)	High FL (≥ 7)	Overall
Low BTA (≤ 3)	5.04%	10.94%	8.12%
	(834)	(914)	
High BTA (≥ 4)	3.53%	8.42%	6.38%
	(340)	(475)	
Overall	4.60%	10.08%	7.57%

	Panel B: Passive fund knowledge		
(No. of subjects)	Low FL (≤ 6)	High FL (≥ 7)	Overall
Low BTA (≤ 3)	62.47%	88.41%	75.34%
	(1087)	(1070)	
High BTA (≥ 4)	72.82%	92.54%	84.50%
	(379)	(550)	
Overall	65.14%	89.81%	78.09%

Table 13: Determinants of index fund or ETF choice

This table presents the results of regressing an indicator variable equal to 1 if the latest fund purchased was an index fund or exchange traded fund on Financial Literacy Score, BTA and a set of socioeconomic and demographic variables. We report regression results for a probit model. Standard errors are in parentheses. * indicates significance at the 10% level, ** indicates significance at the 5% level and *** indicates significance at the 1% level.

Dependent Variable	**Index fund/ETF**	**Index fund/ETF**
Model	**Probit**	**Probit**
Financial Literacy Score	0.021***	0.020***
	(0.006)	(0.006)
BTA	-0.015**	
	(0.006)	
Residual BTA		-0.016**
		(0.006)
Gender	0.023	0.021
	(0.016)	(0.017)
Internet Channel	0.066***	0.063***
	(0.014)	(0.014)
Residence	0.024***	0.024***
	(0.009)	(0.009)
Finance Profession	-0.026**	-0.030***
	(0.011)	(0.011)
Income	-0.010	-0.012
	(0.012)	(0.012)
Wealth	0.031**	0.029*
	(0.015)	(0.015)
Education	0.015**	0.016**
	(0.006)	(0.006)
Age	0.0001	0.0001
	(0.000)	(0.000)
Observations	2504	2504
Pseudo R2	0.07	0.07

Figure 1: Hypotheses