Abusing ETFs

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Abstract

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Abstract

Do ETFs, one of the most popular investment products in recent times, benefit individual investors? Using data from one of the largest brokerages in Germany, we find that individual investors do not improve their portfolio performance, even before transactions costs, by using these passive products. Using counterfactual analysis, we show that this occurs mostly from buying ETFs at “wrong” points in time rather than choosing “wrong” ETFs. Therefore, adopting a buy-and-hold strategy is more important than selecting better ETFs for individual investors.

Abusing ETFs

One of the most successful financial product innovations of the last twenty years is the Exchange Traded Fund (ETF).[1] The first ETF was launched in Canada in 1990. In 2012, there were 4,731 ETFs with $2 trillion in assets (the same size as the hedge fund asset class), accounting for 16% of NYSE trading volume.[2]

This paper investigates whether these ETFs have benefited individual investors and, if not, why not?[3] This is an important question to answer considering how popular ETFs are even among individual investors.[4] Companies are actively seeking ways to include ETFs in 401(k) defined-contribution plans.[5] Even some regulators are promoting ETFs to individual investors.[6]

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[1] An ETF is an index-linked security. These are instruments that aim to replicate the movements of a particular market and therefore enable the investor to easily buy and sell a broadly diversified portfolio of securities that mimic that market. Investors can buy and sell ETF shares in public markets anytime during the trading day.

[2] "Exchange-traded funds: Twenty years young," *Economist*, Jan 26, 2013.

[3] In this paper, we look only at passive ETFs, which aim to mimic an index. Active ETFs, which aim to outperform an index, are not the subject of this paper. Amongst passive ETFs, we do not differentiate whether ETFs are synthetic or fully replicating, despite the fact that synthetic ETFs may entail additional risk (Ramaswamy 2011). We also look at passive index funds and find results similar to those for passive ETFs, but do not report these results in this paper because ETFs, not index funds, are the subject of this paper.

[4] Charles Schwab, the biggest U.S. discount brokerage, offers more than 175 commission-free ETFs to individual investors (Schwab ETF OneSource,

http://www.schwab.com/public/schwab/investing/accounts_products/investment/etfs/schwab_etf_onesource).

[5] "Are ETFs and 401(k) Plans a Bad Fit?" *Wall Street Journal*, April 5, 2012.

[6] The Securities and Markets Stakeholder Group of the European Securities and Markets Authority (ESMA) states that "ETFs are a low cost and straightforward investment proposition for investors and, as such, ESMA should investigate how to make indexed ETFs more offered to individual investors." (ESMA Report and

The null hypothesis is that individual investors have benefited by using passive ETFs. Classical finance theory supports this hypothesis. These products are linked to well-diversified security baskets, and the benefits of diversification have been formalized in seminal papers in finance.[7] Boldin and Cici (2010) reviewed the entire empirical literature on index-linked securities and discussed their benefits. French (2008) measured the benefits of passive investing and concluded, "the typical investor would increase his average annual return by 67 basis points over the 1980-2006 period if he switched to a passive market portfolio." Benefits of diversification and passive investing may be even more pronounced for individual investors, given that they significantly under-diversify and over-trade.[8] ETFs have other benefits, too. Their fees are lower compared to many other investment products. Second, ETFs trade in real time. Third, ETFs have tax advantages (Poterba and Shoven 2002).

The alternate hypothesis is that individual investors have not benefited by using index-linked securities like ETFs. There is some evidence that investors may not be using index-linked products wisely. Hortaçsu and Syverson (2004) found large fee dispersions although the analyzed index funds were financially homogeneous. Similarly, Elton, Gruber

Consultation paper – Guidelines on ETFs and other UCITS issues, 25 July 2012, http://www.esma.europa.eu/system/files/2012-474.pdf, p. 32).

[7] Markowitz (1952) suggested we diversify by buying optimal portfolios. Tobin (1958) suggested that we require only one optimal portfolio provided that a risk-free asset exists. In his capital asset pricing model (CAPM), Sharpe (1964) concluded that this optimal portfolio was the market portfolio.

[8] The portfolios of individual investors who participate in equity markets typically show sub-optimal degrees of diversification (e.g., Blume and Friend 1975; Kelly 1995; Goetzmann and Kumar 2008) and concentration on the home region ("home bias", e.g., French and Poterba 1991; Cooper and Kaplanis 1994; Lewis 1999; Huberman, 2001; Zhu 2002; Ahearne, Griever and Warnock 2004; and Calvet, Campbell and Sodini 2007). They are also shown to trade too much (Odean 1999; Barber and Odean 2000).

and Busse (2004) showed that though S&P 500 index funds have become commodities that differ from each other principally in price, investors in these funds irrationally prefer more expensive funds. Choi, Laibson and Madrian (2010) confirmed this behavior in an experiment and found that more financially sophisticated investors pay fewer fees. Second, it is conceivable that although ETFs force the individual investors to buy a basket and therefore curb their temptation to pick stocks, these securities, because they are highly correlated with the index and are easy to trade, may enhance their temptation to time the underlying index.[9] Third, it seems conceivable that investors may have difficulty choosing ETFs because these ETFs are now linked to more than 200 different underlying indices (cf. Blackrock 2011). Moreover, many of these indices mimic not just well-diversified market baskets but sectors or industries. Fourth, issuers of ETFs may be subjected to conflicts of interest resulting in increased asset volatility and/or a (small) price discount (Cheng, Massa and Zhang 2013).

The key contribution of this paper (to our knowledge, the first of its kind) is that we use the individual trading data of a large number of individual investors to test whether ETFs have benefited them.[10]

Who uses ETFs? In terms of demographics, we find that users of ETFs tend to be younger and have a shorter relationship with the brokerage. In terms of portfolio characteristics, users are wealthier in terms of both portfolio value and overall wealth. Müller and Weber (2010), using a survey methodology, reported comparable results.

[9] In Germany, by 2009, the turnover in ETFs (data obtained from Deutsche Börse 2010) had become about the same as the turnover in stocks (data obtained from the World Federation of Exchanges 2013).

[10] In essence, we test whether the portfolio performance of individual investors improve after they use ETFs. An ex-ante test like the one proposed by Calvet, Campbell and Sodini (2007) will fail to incorporate the effects of trading.

However, the key question is what occurs once investors use ETFs. So we compare the portfolio performance of users with all non-users in a panel setting. To be precise, we estimate the marginal contribution of ETFs to an individual's portfolio return achieved in the period an ETF is held in the individual's portfolio. We not only look at raw returns but also at risk-adjusted returns using 1-, 4-, and 5- risk-factors. For the market factor, we use a global index (MSCI All Country World Index "MSCI ACWI") as well as the broadest local index (CDAX). The first benchmark is for global investors and the second benchmark is for local investors. We use both indices for robustness. In our factor models that include a bond factor we add the JPM Morgan Global Bond to the MSCI ACWI as a fixed income benchmark for global investors and the RDAX to the CDAX as a fixed income benchmark for local investors.

The panel setting allows us to control for investor fixed effects, and so we need not worry about the fact that the use of ETFs may be dependent on time-invariant investor characteristics like gender. The panel setting also allows us to control for observable time-varying portfolio characteristics, and so we need not worry about the fact that the use of ETFs is dependent on time-varying portfolio characteristics like portfolio performance until that point in time. The panel setting also allows us to control for year fixed effects, and so we need not worry about the fact that ETF returns spike up or crash in particular years because of macro conditions or tax law changes. The panel setting, however, does not allow us to control for unobservable time-varying variables that may affect ETF returns.

Using the above research design, we find that portfolio performance, as measured by any of the above portfolio performance measures using any benchmark index, decreases with ETF use, though not statistically significantly so. However, the effect is always negative and economically large. The average ETF investor, if he had invested in ETFs, would have decreased his net raw return by -2.1% p.a. and his alpha by -1.57% to 5.20% depending on the benchmark. Our conservative conclusion is that individual users of ETFs do not improve their portfolio performance by using ETFs.[11]

We next analyze why there is no improvement in portfolio performance for the users during an ETF use. It could be because of the unwise use of ETFs or it could be because of the unwise use of the non-ETFs. To rule out the latter reason, and to test whether the use of ETFs is to be blamed for the deterioration in portfolio performance, we divide the users' portfolios into their ETF part and their non-ETF part. We analyze the performance of these two parts separately, compare them to the full portfolio, and test the differences at the single investor level controlling for potential cross-correlation. We find that the performance deterioration experienced by the users while using ETFs is driven by the ETF part. We also find that the addition of ETFs makes the full portfolio less efficient (the Sharpe ratio of the full portfolio is lower than the Sharpe ratio of the non-ETF part). This means that investors not only have a worse performance in their ETF part as compared to their non-ETF part, but even the diversification benefit to the full portfolio that ETFs are supposed to bring is non-existent. The last finding rules out the possibility that ETFs are used as hedging instruments. Finally, we notice that net returns are lower than gross returns by the same order of magnitude in both the ETF part as well as the non-ETF part, suggesting that the portfolio performance deterioration after ETF use is not because of excessive trading in ETFs compared to non-ETFs.

[11] The results of a difference-in-difference test support this conclusion. The details on the exact matching procedure and the results are presented in the Internet Appendix.

After ruling out the above suspects, we now go on to detect the real cause of performance deterioration experienced by users after ETF use. To do this, we construct counterfactual portfolios. We construct four buy-and-hold ETF portfolios, portfolios in which investors are made to just buy their ETFs, or just buy their first ETF, or just buy a MSCI World fund at all their buy days, or just buy a MSCI World fund at the first buy date[12]. We find that the net portfolio return of investors in the ETF part improves from these buy-and-hold strategies by more than 2% per annum. We also construct another counterfactual ETF portfolio, where we replace all the ETF trades with trades in the "right" fund (the MSCI World fund.) Interestingly, the improvement in net portfolio performance in the ETF part is now less than 1% per annum. Results are qualitatively similar if we use a DAX fund instead of the MSCI World fund.[13]

The above results allow us to conclude that the drop in portfolio performance during ETF use that we observe is because investors lose money more from buying ETFs at the "wrong" points in time rather than from choosing the "wrong", i.e. ex-ante inefficient, ETFs. Therefore, for individual investors in our sample, adopting a buy-and-hold strategy is more important than selecting better ETFs.

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[12] We replace the original ETF trades with a MSCI World fund. The MSCI World is a theoretically efficient choice from an ex-ante perspective. This is because the MSCI World, as a proxy of the market portfolio, promises the highest expected Sharpe Ratio assuming that investors do not have private information and that capital markets are semi-strong form efficient. Which MSCI World fund do we actually choose? We chose the Vanguard Global Stock Index Fund that tracks the MSCI World. We chose this fund for many reasons. First, this fund is well known and would have been available at an expense ratio of 0.5% p.a. to our investors throughout our entire observation period. Alternatives like a value-weighted portfolio of all assets held by all investors is not available as an ETF. Other well-known funds have inception dates that do not cover our entire observation period. Note that all results hold qualitatively if we use an investable ETF on the German DAX index instead of the MSCI World.

[13] If we focus on the net returns of the whole portfolio instead of just the ETF part, improvements become smaller as the ETF part only makes up a fraction of each investor's portfolio. However, more importantly, the improvements are still more for the buy-and-hold portfolios than for the portfolio with the "right" fund.

The benefits from a buy-and-hold-strategy are twofold. First, as our analysis reveals, investors are bad at deciding when to trade ETFs, and so a buy-and-hold strategy prevents investors from trading at "wrong" points in time. Second, the positive effects on gross performance are amplified for net performance as trading costs in buy-and-hold strategies are naturally lower.

Our paper thus points out that the wonderful innovation of passive ETFs, with its enormous potential to act as a low cost and liquid vehicle for diversification, may not help individual investors to enhance their portfolio performance, even before transactions costs, if they actively abuse passive ETFs by trading them at wrong times. Ironically, the low cost and high liquidity of these ETFs seem to encourage trading and aggravate the individual temptation to engage in this behavior. From a policy perspective, encouraging individual investors to invest in well-diversified ETFs needs to be supplemented by advice to trade them less frequently.

Section I details the data. Section II examines which individual customers are most likely to use ETFs. Section III investigates whether users improve their portfolio performance compared with non-users and finds that the answer is no. Section IV examines why users do not improve their relative portfolio performance. Section V concludes.

I. Data

a. ETFs and Index-linked Securities in Germany

Individuals in Germany, as in the U.S., who want to invest in index-linked securities may choose Exchange Traded Funds (ETFs) and/or index mutual funds.

Panel A in Table I summarizes the market for index-linked securities in Germany. Panel B in Table I provides the same data for the U.S. Panel C in Table I provides the same for our German sample. For each of the three panels, index-linked securities are compared with the active mutual fund market. As a result of data availability, the three panels represent a snapshot of the market at different times. For Germany and the U.S., the data for the end of 2011 are available, whereas these data for our sample are available only for the end of 2009.

[INSERT TABLE I ABOUT HERE]

The last column in Table I, Panels A and B, shows that the total assets under management invested in index-linked securities relative to total active mutual fund investments, a ratio of about 20%, is comparable between Germany and the U.S. Panels A and B also tell us that the market in the U.S., as expected, is much larger as measured by assets under management or the number of index-linked products offered. Interestingly, in terms of assets under management, the market splits almost evenly between passive ETFs and index mutual funds in the U.S., whereas in Germany, passive ETFs comprise 84% of the market.

If Panel A (Germany) is compared with Panel C (our sample) in Table I, in terms of the proportion of assets under management in each security class, our sample seems to be representative of the entire German market.

b. ETFs in our sample

We focus only on ETFs in this paper for two reasons. First, as can be seen in Table I, ETFs are the predominant index-linked security in Germany as well as in our sample. Second, as the construction and trading of index funds are different from ETFs, we do not want to bundle the two together.[14] Among ETFs, equity-based ETFs form about 80% of all ETFs in Germany (Deutsche Börse (2010)). In our sample, equity-based ETFs are even more important and make up 83%.

Table II shows the rich diversity of ETFs in our sample.

[INSERT TABLE II ABOUT HERE]

Panel A of Table II tells us that the individual investors in our sample have many choices when it comes to selecting ETFs. It is a very fragmented market. Although the top 10 benchmark indices constitute over 60% of the assets under management in ETFs, 207 other benchmark indices make up the remainder. Notice that the popular indices are connected to Germany, Europe and the World, which motivates us to use the local German index, CDAX, and a global index, MSCI ACWI, as our two choices of benchmark indices.

Panel B of Table II examines the regional allocations of these ETFs. Germany is the most popular, followed by Europe. German individual investors, like individual investors all over the world, exhibit home bias.

Panel C of Table II examines the asset class of ETFs. We find that ETFs based on equity indices dominate (83.4% of assets under management), which further justifies our use of equity indices like MSCI ACWI and CDAX as benchmarks. However, as there are a few bond and commodity based ETFs as well, we also use a 5-factor model that includes a bond factor in our main test for robustness.

[14] Though we do not bundle ETFs and index funds together because they are constructed differently, the economic intuition of our paper applies to index funds as well as ETFs. Therefore, as mentioned before in footnote 3, we replicate all our tests for passive index funds. We find results similar to those for passive ETFs.

Panel A of Table II also tells us that many ETFs are linked to narrow indices; so it is likely that these ETFs offer more choices for timing certain asset classes, sectors or countries, rather than opportunities for broad diversification. If so, their beta loadings with respect to our benchmarks, MSCI ACWI and CDAX, could be very different from 1. To analyze this issue, in Panel D of Table II, we show the beta loadings of all ETFs with respect to the MSCI ACWI and the CDAX. The beta loadings are 0.87 and 0.70 and they are statistically significantly different from 1. However, if we narrow our sample to equity ETFs, the beta loading with respect to MSCI ACWI cannot be distinguished from 1, but the beta loading with respect to CDAX is still different from 1. Panel D of Table II also tells us that the tracking errors are high. This is not suprising, because most of the ETFs do not track the CDAX or the MSCI ACWI. The most important thing that Panel D of Table II tells us is that, though many of these ETFs may not be tracking the MSCI ACWI or CDAX perfectly, they are not bad investment products because their alphas with respect to these indices are indistinguishable from zero.

c. Individual Investors

The brokerage that we work with was founded as a direct bank with a focus on offering brokerage services via telephone and the Internet. In 2009, to retain existing customers and attract new ones, the brokerage introduced a financial advisory service, which offered free financial advice to a random sample of about 8,000 investors. Approximately 96% of these individual investors refused the financial advice and continued trading as before.[15] Our starting sample is these 7,761 investors. The knowledge that these investors

[15] Bhattacharya et al. (2012) analyze the same sample with a focus on the 4% of the individual customers who accepted the advice.

refused to opt for advice assures us that our sample is composed of self-directed investors whose decisions are not distorted by a third party. As we are focusing on ETFs, we remove investors who use index mutual funds. We additionally restrict our sample to investors who on average have at least 5,000 Euros in their portfolios. We do so to avoid a bias introduced by small play money accounts. Our final sample has 6,956 investors in an unbalanced panel that begins on August 2005 and ends on March 2010. Of these 6,956 investors, 1,087 investors traded at least one ETF in this sample period – the "users" – and 5,869 investors who traded no index-linked security in this sample period – the "non-users".

[INSERT FIGURE 1 ABOUT HERE]

The solid black line in Figure 1 shows the share of ETFs in the portfolio of an average individual investor. It seems that once investors have switched to ETFs, their weight in the portfolio hardly exceeds 20%.

The dashed gray line in Figure 1 shows the growing popularity of ETFs in our sample. The sharp increase in ETF-share in December 2008 is supposedly related to a tax change in Germany. From 2009 onwards, all capital gains and losses, irrespective of the holding period, are subject to taxation. Gains and losses from securities purchased before the end of 2008, if held for longer than 1 year, are tax free. Thus, it is possible that some investors switched to ETFs to ensure a tax advantage. Because stock returns were above average in 2009, the effect of switching to ETFs for tax reasons in this year would show up as a spurious benefit of ETF usage. In order to mitigate this effect, we include year fixed-effects. The positive bias may still remain after the inclusion of year fixed-effects, but this positive bias goes against our results because our results show ETF usage to negatively affect portfolio performance.

We collected data on client demographics, monthly position statements and daily transaction records for both users and non-users in the sample period. Client demographics were collected from the bank and are comprised of gender, age and micro geographic status. The micro geographic status variable measures the average wealth level of individuals who inhabit a given micro area (street level address). The variable has nine categories, with category nine comprising the wealthiest individuals. This variable is provided by a specialized data service that uses several factors (such as house type and size, dominant car brands, rent per square meter and the unemployment rate) to construct the variable.

In addition, account characteristics were provided by the bank. For all of the customers, we possess monthly position statements, daily transaction data and account transfers for the period August 2005 to March 2010. The account opening date enables us to compute the length of the relationship between a customer and the brokerage. Monthly position statements combined with transactions, transfers and securities' returns enable us to compute daily position statements and the average risky portfolio value over the entire period. In addition, we have information on the cash accounts of each customer at the beginning and the end of our sample period, which enables us to calculate the risky share as the risky portfolio value divided by financial wealth with the brokerage (risky portfolio value plus cash value). We use our transaction records to calculate portfolio turnover and number of trades per month, as in Barber and Odean (2002). We also obtain monthly return series for the following factors: a market factor (CDAX or MSCI ACWI), a bond factor (RDAX or JP Morgan Global Bond), small minus big (SMB), high minus low (HML) and the momentum factor (MOM). The sources of this data are given in Table III.

[INSERT TABLE III ABOUT HERE]

We first infer the daily holdings from the monthly position statements, security transactions and account transfers. To obtain the next end-of-day holdings, we multiply the end-of-day value of each holding by the corresponding price return (excluding dividends but considering any capital actions) for that security. These holdings are then properly adjusted for any sales, purchases and account transfers that occurred that same day. We repeat this procedure for each security and investor for each trading day in a given month. The holdings on the last day of each month are then reconciled with the true holdings obtained from the brokerage.

Second, we compute daily portfolio returns as the weighted average of the returns of all of the securities held, purchased or sold by the investor on that day. We use total return data (including dividends) for securities without transactions on that day. For securities that are either purchased or sold, we consider exact transaction prices to compute returns. We weight each security's return to calculate the investors' daily portfolio returns. All of the holdings and sales are weighted using euro values on the basis of the previous day's closing prices. All of the purchases are weighted using the transaction value in euros.

Finally, we calculate daily portfolio returns before (gross) and after (net) direct transaction costs to account for brokerage fees and bank commissions.

II. Who uses ETFs?

Table IV provides summary statistics about the investors in our sample. This table divides the sample group into users and non-users. The p-values of the t-tests from our tests for the equality of variables across these two groups are provided in the last column.

[INSERT TABLE IV ABOUT HERE]

Table IV shows that users and non-users differ. In this univariate setting, users of ETFs seem to be slightly younger and wealthier. Moreover, they have a shorter relationship with this bank, a higher share of their portfolio in risky securities at the end of the sample period, a higher risky portfolio value during the sample period, and they trade more often during the sample period. We do not find any differences in alphas over the entire sample period, which is consistent with the view that there are no significant differences in skill or sophistication between users and non-users.

[INSERT TABLE V ABOUT HERE]

Table V formally tests the findings of Table IV in a multivariate probit model. The dependent variable is set to one if an investor opted to use ETFs at least once in our sample period and is set to zero otherwise. The independent variables are the time-invariant variables that we know at the start of our sample. Table V confirms that it is really younger and wealthier (in terms of portfolio value) investors who are more likely to use ETFs. This is consistent with numerous findings in the marketing literature (see, for example, Dickerson and Gentry (1983)) that document early adopters to be younger and wealthier.

III. Do Individual Investors Benefit by Using ETFs?

We now address the most important question of our study: do users benefit from ETFs? In order to address this question, our analysis uses data from all users as well as all non-users in our entire sample period. This allows us to exploit all the information that our panel dataset has to offer. Our primary research design is to estimate the following model:

$$r_{i,t} = \propto_i + \beta_1 * \boldsymbol{ETF_{i,t}} + \beta_2 * \boldsymbol{MF_t} + \beta_3 * \boldsymbol{TF_t} + \beta_4 * \boldsymbol{IC_{i,(t-1\ to\ t-126)}} + \varepsilon_j \tag{1}$$

where $r_{i,t}$ is the excess net return (excess over the 3 month Euribor rate) on investor i's portfolio in day t, α_i denotes the fixed-effects of investor i, $\boldsymbol{ETF_{i,t}}$ is a dummy variable set to 1 if investor i has invested in ETFs on day t[16], and $\boldsymbol{MF_t}$ is a vector representing the return of factors like the market factor in time period t. Depending on the specification, this vector may contain nothing or just the market index (MSCI ACWI or CDAX) or additional factors like SMB (small-minus-big), HML (high-minus-low), MOM (Momentum factor) or a bond factor. $\boldsymbol{TF_t}$ represents a vector with year fixed effects. $\boldsymbol{IC_{i,(t-1\ to\ t-126)}}$ is a vector of time-varying characteristics (log of the portfolio value, alpha, turnover and number of trades) of the portfolio of investor i over the rolling window t-126 (days) to t-1.

The coefficient, β_1, is our coefficient of interest. It measures the change in portfolio performance when ETFs are in the portfolio. If we run the above equation without $\boldsymbol{MF}_t$, this coefficient measures the change in portfolio performance without risk-adjusting, whereas if we run the above equation with $\boldsymbol{MF}_t$, this coefficient measures the change in portfolio performance after risk-adjustment. The β_2 coefficients are the betas or factor sensitivities with respect to the different factors that we use. The β_3 coefficients are the effect of a given year, which we will not show in our table because of lack of space. The β_4 coefficients are the coefficients with respect to the time-varying portfolio characteristics of the investor.

The results of regression (1) are shown in Table VI. Column (1) gives the results for raw net returns, whereas the other columns give the results for risk-adjusted net returns. Column (2) risk adjusts using the one-factor MSCI ACWI, column (3) risk adjusts using the

[16] Our results are qualitatively similar if we use the continuous fraction of investors' portfolio value that is invested in ETFs instead of the dummy specification. However, the coefficient is much more difficult to interpret.

MSCI ACWI factor and a world bond factor, column (4) risk adjusts using the 1-factor CDAX, column (5) risk adjusts using the CDAX factor and a local German bond factor, column (6) risk adjusts using the 4-factor model that uses the CDAX factors, and column (7) risk adjusts using the 5-factor model that uses the CDAX factors and a local German bond factor.

[INSERT TABLE VI about here]

In table VI we use year fixed effects. These year fixed effects control for any events in a given year that change the propensity to purchase ETFs in a given year, such as the crisis years of 2007-08 or years in which tax policy on investment profits changed. In our sample this is particularly important since a tax law change took place in Germany at the end of 2008. From 2009 onwards, all capital gains and losses, irrespective of the holding period, are subject to taxation. Gains and losses from securities purchased before the end of 2008, if held for longer than 1 year, are tax free. Because it is possible that some investors switched to ETFs to ensure a tax advantage in 2009 (see figure 1), a year in which stock returns were above average, the effect of switching to ETFs for tax reasons in this year would show up as a spurious benefit of ETF usage.

In table VI we also use investor fixed effects. Instead of controlling for gender, age, and micro geographic status, we decided to go with investor fixed effects since these capture the above effects as well as the effects of any unobservable fixed influences on the probability to purchase ETFs.

Though investor fixed effects control for all time invariant characteristics of investors, the criticism remains that the choice of using an ETF may still be endogenous because we have not controlled for time-varying variables. To mitigate this, we control for the following time-varying portfolio characteristics of the investor that we can observe: log portfolio value, past performance as measured by a 1-factor alpha with the CDAX as the benchmark, and trading behavior measured by number of trades and portfolio turnover. We use the rolling moving average of the past 126 trading days to calculate each of these four variables.

We cluster standard errors by date in all our regressions to take care of cross-sectional correlation and to be as conservative as possible. This level of clustering in our case leads to lower t-stats than a two-way cluster on investor and date as suggested by Petersen (2009). It is also less computationally extensive since Petersen's (2009) methodology does not allow for a built in inclusion of investor fixed effects. In tests whose results are not reported, we found that if we had not clustered standard errors by date, and would therefore have assumed investor by investor independence of returns, t-values would have on average been 5 times higher.

We notice, in all the seven models of table VI, that the coefficient on the dummies "Use of ETFs" are reliably negative, though none are statistically significant. The average ETF investor, if he had invested in ETFs, would have decreased his net raw return by -2.1% p.a. and his alpha by -1.57% to 5.20% depending on the benchmark.

Our conservative conclusion is that individual investors do not improve their portfolio performance after using ETFs.

To ensure the robustness of this result we use an alternate methodology – propensity score matching – and exploit the fact that a sizeable number of investors in our sample only start using ETFs within the sample period. We match by demographic variables and construct a peer-group of non ETF users which resembles the group of ETF users as much as possible. This control group of non-users as well as the treatment group of users is then used in a difference-in-difference design, which allows inferences with self-selection and endogeneity issues reduced to a minimum. The results of the difference-in-difference test support the conclusion drawn above: Individual investors who use ETFs do not improve their portfolio performance. The details on the exact matching procedure and the results are presented in the Internet Appendix.

IV. Why Do Individual Investors Not Benefit by Using ETFs?

a. Are ETFs responsible for the performance deterioration?

In the previous section, we showed that individual investors do not benefit when they hold ETFs in their portfolio. However, we have not yet established that it is really the ETFs that are causing this performance deterioration. There are three rather obvious reasons that would explain our finding of the previous section, but would lead us to falsely accuse ETFs as the reason for the performance deterioration. The first possibility is that performance deterioration may stem from the non-ETF part rather than the ETF part of an investor's portfolio. The second possibility is that investors sacrifice returns by using ETFs as hedges and improve the diversification of their portfolios. The third possibility is that investors simply trade more in ETFs than in other securities and this worsens their net returns after use.

To investigate these three reasons, we define two split portfolios for each investor: the non-ETF part of his portfolio (portfolio # 1) and the ETF part of his portfolio (portfolio # 2). The full portfolio of all securities is called portfolio # 0. We assume that if an investor holds no ETFs on a given day, we assume that portfolio # 1 is portfolio # 0 on that day. [17]

[INSERT TABLE VII PANELS A AND B ABOUT HERE]

[17] For robustness, we also repeated this analysis using only those days when an investor holds both an ETF part and a non-ETF part. All results described below remain qualitatively unaltered.

We use several metrics for performance evaluation of each of these three portfolios: the return, the standard deviation, the Sharpe Ratio, Jensen's Alpha and the unsystematic variance share. To compute the alpha and the unsystematic variance share, we use the MSCI ACWI as the benchmark as we did before.

In Panel A of Table VII, we find that the "ETFs" portfolio performs worse than the "No ETFs" portfolio, whether performance is measured by net returns, Sharpe ratio or net alphas. In Panel B, we also find that the "ETFs" portfolio performs worse than the "No ETFs" portfolio before transaction costs. Thus, it is the ETF part and not the other securities, which cause the performance deterioration. The results shown in this table also rule out that ETFs are used as hedges. If ETFs were used for hedging, the Sharpe ratio of the "All securities" portfolio should improve relative to the one for the "No ETFs" portfolio. We notice that the Sharpe ratio of the "No ETFs" portfolio is always higher than the Sharpe ratio of the "All securities" or "ETFs" portfolio in both Panel A (net Sharpe ratio) and Panel B (gross Sharpe ratio). Finally, the results shown in table VII also rule out overtrading in ETFs as the reason for the performance deterioration. The after transaction cost alpha, as observed in Panel A, is -4.25% for the "No ETFs" portfolio and - 5.53% for the "ETFs" portfolio. The alpha before transaction costs for the "No ETFs" and the "ETFs" portfolio, as observed in Panel B, is -3.23% and -4.49 %, respectively. The drop in alphas because of transactions is on the order of 1% for both parts. Therefore, the costs that investors incur in trading ETFs are about the same as they incur in trading non-ETFs, which implies that there is no overtrading in ETFs compared to non-ETFs.

b. Why are ETFs responsible for the performance deterioration?

To address this question, we use counterfactual analysis. The idea of this analysis is to investigate the portfolio performance of an investor assuming he traded in a different security and/or applied a different trading strategy.

Counterfactual portfolio analysis has many advantages in our context. First, it allows for inferences at the level of an individual investor, solving issues of self-selection and endogeneity, because we look at changes to the performance of the portfolio of the same investor at the same point in time. Second, our approach has the advantage that we can directly alter the transaction behavior of investors to draw conclusions on market timing and security selection abilities. In contrast to other approaches, we do not have to rely on return series or changes of returns in response to changes to portfolio holdings to infer security selection and market timing abilities.[18] Third, in comparison to Odean (1999) who uses individual investors trading records to decompose holding-period-returns of security purchases and sales to investigate market timing and security selection abilities, our counterfactual portfolio approach does not require any assumptions on weighting of trades or lengths of holding-periods.[19]

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[18] See Treynor and Mazuy (1966), Jensen (1968), Henriksson and Merton (1981), Pesaran and Timmermann (1994), Gruber (1996) and Carhart (1997) for "top-down" approaches that use return series. See Jiang, Yao, and Yu (2007), Kaplan and Sensoy (2008), and Elton, Gruber and Blake (2011 and 2012) for "bottom-up" approaches that uses changes of returns in response to changes in portfolio holdings.

[19] Odean (1999) weights trades equally, has different holding-period lengths, and cannot risk-adjust in his framework, whereas in counterfactual portfolios we retain the weighting of the original trade and can risk-adjust.

These counterfactual portfolios allow us to test if investors lose because they trade the "right" ETFs at the "wrong" point in time, or because they trade the "wrong" ETFs at the "right" point in time. As the ETF offerings in Germany are many and are often based on narrow indices (see Panels A, B and C of Table II), a "wrong" ETF is an ETF that promises sub-optimal expected Sharpe-Ratios. From an ex-ante perspective, an ETF which replicates the market portfolio best would be the "right" ETF. Therefore, any ETF that tracks only a tiny sub-market or has too large a tracking error with the market index is a "wrong" ETF. Given these criteria, it seems that the "right" ETF in our context is an ETF on the MSCI World[20].

We define the following five counterfactual portfolios in ETFs. To test the impact of active trading of ETFs we define counterfactual portfolio #3, "B&H", where we disregard all ETF sell transactions. This results in a buy-and-hold portfolio. As counterfactual portfolio #3 may be hard to implement for individual investors because it requires investing additional capital, we define counterfactual portfolio #4, "First buy B&H". Here each investor only buys and holds the first ETF ever purchased. To test the impact of choosing the "right" ETF, we define counterfactual portfolio #5, "ETF trades in MSCI". Counterfactual portfolio #5 substitutes each ETF transaction with a transaction in a Vanguard fund which tracks the MSCI World. To test the impact of actively trading ETFs instead of buying and holding a well-diversified portfolio, we define counterfactual portfolios #6, "B&H in MSCI" and #7, "First buy B&H in MSCI". These two portfolios #6 and #7 mimic the counterfactual

[20] Calvet, Campbell and Sodini (2007) also use the MSCI World Index as the benchmark for Swedish investors holding portfolios containing stocks, funds, bonds and other marketable securities.

portfolios #3 and #4, where we replace the individuals' ETFs with the Vanguard MSCI World fund.[21]

Since we are interested in finding out whether ETFs are responsible for the deterioration in portfolio performance, gross returns and net returns are computed for all counterfactual portfolios. To compute the net returns for the counterfactual portfolios that use the Vanguard MSCI ETF, we retain the costs of the original transactions. The transaction costs on the Vanguard MSCI fund are likely to be lower, but our results do not depend on our choice of transactions costs since all results are also present when using gross returns. [22]

[INSERT TABLE VIII PANELS A AND B ABOUT HERE]

Table VIII summarizes the results of the counterfactual portfolio analysis for the ETF part of the portfolio.

We first examine the results of Panel A, where the performance metrics are computed after transaction costs. The effect of trading ETFs instead of buying and holding ETFs can be seen by comparing the metrics of the original ETF portfolio #2 with the metrics of the

[21] The number of observations may differ between the original ETF and the counterfactual ETF portfolios. This difference depends on the definition of the counterfactual portfolio. For example, if an investor trades in and out of ETFs, there will be days on which she has no ETF position. In a counterfactual portfolio, which adopts a buy-and-hold strategy, there will be a position in ETFs on every day after the first use of an ETF. In order to compare these portfolios, one can adopt two approaches. First, on days on which an investor does not hold an ETF, the returns to the non-ETF part, which are then equal to the returns of the full portfolio, are used. By construction, therefore, any difference between the ETF and non-ETF part can be traced back to days on which both parts are present in an investor's portfolio. Second, on days on which the investor has no ETF position, we could set the return to zero on the ETF part. However, this approach biases the ETF part. For this reason, we use the return of the non-ETF part instead of zero in this counterfactual analysis. Our results are qualitatively the same whichever approach we adopt.

[22] In unreported tests, we find that the MSCI ACWI outperforms the MSCI World in the sample period by about 5% percentage points. The alphas for the buy-and-hold strategy of the Vanguard MSCI World fund are hence not equal to zero, but rather equal to -5 %.

counterfactual ETF portfolios #3 and #4 in Panel A. We notice that a buy-and-hold strategy would have improved the net returns of the ETF part of the portfolio from -3.47% to -0.88% (a net gain of 2.59%) for counterfactual portfolio #3. For counterfactual portfolio #4, the net gain would have been from -3.47% to -0.33% (a net gain of 3.14%). Both gains are statistically significant at the 5% and 1%-level, respectively. The corresponding improvement in alphas is 2.15% and 2.58%.[23] Qualitatively similar findings can be observed by looking at the Sharpe Ratio, which also improves.

Counterfactual portfolio #5 tells us what happens if the "right" ETF, i.e. the ex-ante optimal ETF – the ETF tracking the MSCI World – is traded instead. Notice that returns improve from -3.47% to -3.24%, a net gain of only 0.23%, and it is not statistically significant. Comparing the buy-and-hold portfolios #3 and #4 with their counterpart portfolios #6 and #7, we notice that the gains from replacing the ETF with the MSCI world actually worsens returns (compare -0.88% in portfolio #3 to -1.83% in portfolio #6; compare –0.33% in portfolio #4 with –1.66% in portfolio #7) but does improve alphas (compare -3.38% in portfolio #3 to -3.07% in portfolio #6; compare –2.95% in portfolio #4 with –2.90% in portfolio #7). However, none of the differences between the "ETFs" portfolio #2 and counterfactual portfolios #5 to #7 turn out to be statistically significant.

Panel B of Table VIII shows the performance metrics computed before transaction costs, i.e., the gross returns.[24] As expected, the gross returns are higher than the net returns

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[23] We are using clustered standard errors at the level of the calendar date in combination with investor fixed-effects. Abandoning the clusters or only clustering at the investor level would create highly statistically significant effects. So our results are very conservative.

[24] As investors are only allowed to trade one particular ETF, i.e. the MSCI World fund, there is no performance difference between portfolios 4 and 5 when we use gross returns. The difference comes when we use net returns because portfolio 5 has less trading than portfolio 4.

because of trading costs, particularly for the trading portfolios # 1, 2 and 5 (compare the 1% difference in returns in portfolios #5 between the two panels). Buy-and-hold portfolios #3 and #4 still lead, as in Panel A, to a larger improvement compared to the original ETF portfolio #2 than the improvement brought about by the portfolios #5, #6 and #7 with the MSCI World Fund.

We conclude from the above results in Panels A and B in Table VIII that performance improvement in the ETF part of the portfolio comes mostly from buying-and-holding ETFs rather than using an ex-ante efficient ETF like the MSCI World. Some of that improvement, though not all, comes from the transaction costs saved by buy-and-hold strategies.

The counterfactual portfolios #3, #4, #5, #6 and #7 of Panels A and B in Table VIII had shown only the returns of the ETF part of the investor's portfolio. For the sake of completion, we also show the returns of the counterfactual portfolios 3, 4, 5, 6 and 7 of the full portfolio in table IX. This implies that we have computed the gross and net returns for all the five counterfactual portfolios twice, once for only the ETF part in table VIII, and once for the full portfolio in table IX.

[INSERT TABLE IX PANELS A AND B ABOUT HERE]

Table IX, Panel A, shows that our results are qualitatively similar for net returns: buy-and-hold portfolios #3 and #4 have much higher returns from the original full portfolio #0 compared to the improvement in returns from the original full portfolio #0 shown by the portfolios #5, #6 and #7 with the MSCI World fund.[25] Table IX, Panel B, shows that our results are qualitatively similar for gross returns as well. As a matter of fact, the only qualitative difference in the results shown in Tables VIII and IX is that the magnitude of effects of the counterfactual portfolios is smaller for the full portfolio in Table IX compared to the ETF part of the portfolio in Table VIII. This is to be expected because the effects are dampened by the inclusion of the non ETF part in Table IX, a part which we do not change, but a part which makes up about on average 85% (see figure 1) of an investor's portfolio.

All in all, our counterfactual analysis shows that investors lose money more from trading ETFs at the "wrong" points in time rather than trading the "wrong" ETFs. In all cases, gains from buy-and-hold strategies (counterfactual portfolios #3, #4) are larger than gains from selecting potentially more sensible products like a MSCI World fund (counterfactual portfolio #5). Buy-and-hold strategies also lead to a reduction in trading volume and hence transaction costs. In our dataset, transaction costs of trading erode net alpha by about 1.02% (1.03%) per annum in the no ETF part (ETF part) of their portfolios.

Our counterfactual analysis thus reveals that if investors would adhere to prescriptions of the literature on how to use ETFs, i.e. track a broad market and use a buy-and-hold strategy (counterfactual portfolio #6) instead of abusing them by actively trading, the performance of the ETF part would ceteris paribus increase by roughly 2% per annum for the average investor as measured by Jensen's alpha. Considering that ETFs make up about on

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[25] For robustness, instead of replacing the original transaction with the MSCI World fund, we also construct counterfactual portfolios using an ETF on the DAX. As with the other counterfactual portfolios, investors would have benefited strongly from using buy-and-hold strategies (plus 1.2 percentage points). Alphas from net returns also clearly improve due to a reduction in trading costs relative to the original portfolios. Overall, results remain qualitatively unaltered. However, the DAX performed exceptionally well compared to the MSCI World, which increases the levels of the returns.

average 15% (see figure 1) of a user's portfolio, this is a sizable gain. The gain would potentially be higher if investors replace the no ETF part of the portfolio with ETFs and just buy-and-hold.

V. Conclusion

This paper investigates whether individual investors benefit from using ETFs. We find that the portfolio performance of individual users relative to non-users of ETFs slightly worsens after ETF use. The loss comes mostly from buying ETFs at the "wrong" times rather than choosing the ex-ante "wrong" ETFs. Therefore, adopting a buy-and-hold strategy is more important than selecting better ETFs. The benefits from a buy-and-hold strategy are twofold. First, as our analysis reveals, a buy-and-hold strategy would prevent investors from trading ETFs at "wrong" points in time. Second, the positive effects on gross performance are amplified for net performance as trading costs in buy-and-hold strategies are naturally lower.

Our paper thus points out that the wonderful innovation of passive ETFs, with its enormous potential to act as a low cost and liquid vehicle for diversification, may not help individual investors to enhance their portfolio performance if they actively abuse passive ETFs by buying and selling them at "wrong" times. Ironically, the low cost and high liquidity of these ETFs seem to encourage their trading, and this aggravates an individual's temptation to engage in some sort of timing. Our finding should make regulators, consumer protection agencies, companies with 401k plans, and financial economists more cautious when recommending ETF use. From a policy perspective, therefore, promoting savings on well-diversified ETFs that simultaneously limit the potential to actively trade in them might be beneficial to individual investors.

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Figure 1

The use of ETFs in our sample

The figure presents the usage of ETFs over time. The solid line (left axis) shows the average share of ETFs in terms of euros in the portfolios of users (*ETF share in %*). The dashed line (right axis) shows the cumulative number of users at that point in time.

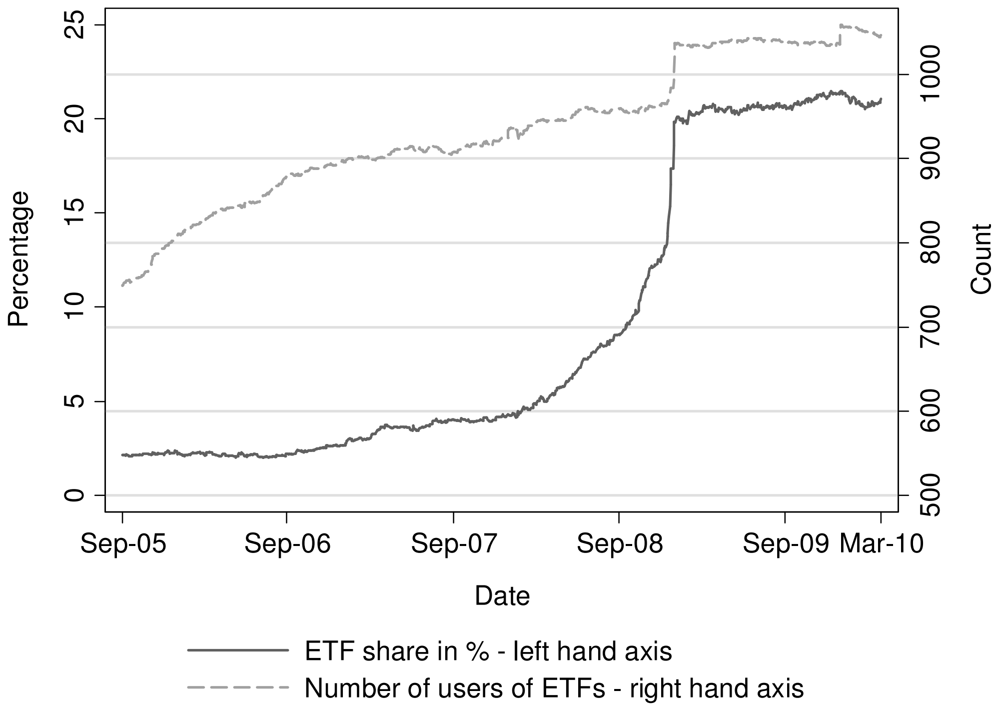

Table I

Usage of index-linked securities – an overview

Table I provides an overview of the markets for ETFs and index funds in Germany (Panel A), the U.S. (Panel B) and within our sample (Panel C). For all panels, the latest available year-end data have been used. We report number of products as well as assets under management (AUM) in absolute and percentage terms. The last two columns compare ETFs and index funds with active mutual funds in terms of number of available products and assets under management.

	Index-linked securities				As % of active mutual funds	
	# of products	%	AUM in € m	%	# of products	AUM
Panel A: Index-linked securities in Germany[1]						
Passive ETFs	826	86%	99,311	84%		
Index mutual funds	135	14%	18,353	16%		
Total	961	100%	117,664	100%	17%	20%
Panel B: Index-linked securities in the US[2]						
Passive ETFs	1,028	73%	934,216	46%		
Index mutual funds	383	27%	1,094,296	54%		
Total	1,411	100%	2,028,512	100%	23%	21%
Panel C: Index-linked securities held by our investors[3]						
Passive ETFs	279	90%	17	95%		
Index mutual funds	30	10%	1	5%		
Total	309	100%	18	100%	17%	16%

[1] As of December 31, 2011. Sources: BVI, Deutsche Börse.
[2] As of December 31, 2011. Source: Investment Company Institute Factbook 2012.
[3] As of December 31, 2009. This table focuses on the same set of investors as in the remainder of the paper, except for investors who hold index mutual funds. In what follows these investors are excluded.

Table II

What kind of ETFs do investors buy?

Panel A: This shows the average amount of Euros invested per day in a passive ETF as a percentage of the total average amount of Euros invested per day in all ETFs.

Benchmark index	Share in %
DAX	24.1%
EURO STOXX 50	9.7%
MSCI Emerging Markets	5.9%
MSCI World	5.2%
EONIA	4.6%
ShortDAX	3.2%
STOXX Europe 600	2.9%
EURO STOXX Select Dividend 30	2.7%
LevDAX	2.5%
STOXX Europe 600 Basic Resources	2.1%
Other (207 indices)	37.0%
Total	100.0%

Panel B: This shows the average amount of Euros invested per day in a region using passive ETFs as a percentage of the total average amount of Euros invested per day in all ETFs.

Country / region	Share in %
Germany	34.4%
Europe	33.4%
Emerging markets	9.4%
World	9.3%
USA	5.4%
China	2.3%
Japan	1.2%
Russia	1.0%
Brazil	1.0%
Asia	0.7%
Other	1.9%
Total	100.0%

Panel C: This shows the average amount of Euros invested per day in an asset class using passive ETFs as a percentage of the total average amount of Euros invested per day in all ETFs.

Asset class	Share in %
Equity	83.4%
Bonds	12.2%
Commodities	4.3%
Other	0.1%
Total	100.0%

Panel D: This shows the distribution of beta, alpha and tracking error of all ETFs (top panel) and ETFs based on equity indices (bottom panel) that investors in our sample use. Beta, alpha and tracking error (RMSE) result from a regression of ETF returns on the MSCI ACWI or the German benchmark index CDAX and are being estimated separately for each ETF. Reported p-values result from a t-test of Betas and alphas against 1 and 0, respectively. Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less.

	All ETFs							
Metric	N	Mean	p-Value	Median	10%	25%	75%	90%
Benchmark: MSCI World All Country								
Beta	353	0.87	.000***	1.05	-0.05	0.61	1.23	1.54
Alpha in % p.a.	353	-0.03	.960	-0.20	-10.09	-4.75	4.28	11.25
Tracking Error in % p.a.	353	27.78		22.75	10.38	17.31	32.39	41.32
Benchmark: CDAX								
Beta	353	0.70	.000***	0.83	-0.04	0.45	1.03	1.25
Alpha in % p.a.	353	-0.76	.213	-0.64	-12.49	-6.42	3.92	10.92
Tracking Error in % p.a.	353	26.34		21.39	9.63	15.89	30.43	41.00

	ETFs on Equity Indices							
Metric	N	Mean	p-Value	Median	10%	25%	75%	90%
Benchmark: MSCI World All Country								
Beta	284	1.03	.353	1.09	0.64	0.95	1.30	1.57
Alpha in % p.a.	284	-0.03	.967	-0.74	-9.75	-4.87	5.06	13.05
Tracking Error in % p.a.	284	30.34		24.38	16.33	18.94	33.58	43.38
Benchmark: CDAX								
Beta	284	0.83	.000***	0.90	0.47	0.72	1.07	1.28
Alpha in % p.a.	284	-0.97	.178	-2.16	-12.89	-6.80	4.47	12.06
Tracking Error in % p.a.	284	28.59		22.59	14.30	17.79	31.49	42.69

Table III

Data collected

Table III summarizes the data collected during the course of the study.

Type of data	Data	Frequency	Source of data
Client demographics	Gender	Time-invariant	Bank
	Date of birth (measure of age)	Time-invariant	Bank
	Microgeographic status (measure of wealth)	Time-invariant	Bank
Portfolio characteristics	Actual position statements	Monthly	Bank
	Actual transactions and transfers	Daily	Bank
	Cash	On start and end of dataset	Bank
	Account opening date (measure of length of relationship)	Time invariant	Bank
Market data	German Fama and French (1993) & Carhart (1997) factors	Daily	Datastream / own calculation
	MSCI World All Country (Jensen (1968)	Daily	Datastream
	CDAX (Jensen (1968)	Daily	Datastream
	RDAX	Daily	Datastream
	JP Morgan Global Bond	Daily	Datastream
	Individual security prices	Daily	Datastream
	Individual security properties	Time-invariant	Bank / Deutsche Börse

Table IV

Summary statistics for "Users" and "Non-users"

Table IV reports summary statistics on client demographics, investor characteristics and portfolio characteristics. The columns "Users" and "Non-users" present means, medians and the number of observations for the respective clients in each group. The last column reports the p-values of a difference of means t-test. Client demographics are comprised of statistics on the share of male clients (*Gender*), the age of clients (*Age*) and the wealth of a client measured by the micro-geographic status rating, one through nine, assessed by an external agency (*Wealth*). Investor characteristics are comprised of statistics on the number of years the client has been with the bank (*Length of relationship*) and the proportion of risky assets (*Risky share*) held with this brokerage at the beginning (*08/2005*) and at the end (*03/2010*) of our sample period. Portfolio characteristics are comprised of statistics on the average risky portfolio value (*Average risky portfolio value*) of the customer during our observation period (*08/2005 – 03/2010*), the average number of trades per month (*Average number of trades*), the average portfolio turnover per month (*Average portfolio turnover*) and alphas net of transaction costs for the MSCI ACWI and the CDAX (*Alpha*). Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less.

		Users			Non-users			*t*-test (Users vs. Non-users)
Metric	Measurement units	Mean	Median	*N*	Mean	Median	*N*	*P*-value
Client demographics								
Gender	Dummy = 1 if male	80.9	100.0	1087	82.0	100.0	5,869	.377
Age	Years	47.9	46.0	1087	49.8	48.0	5,869	.000***
Wealth	Microgeoraphic status	6.5	7.0	958	6.3	6.0	5,164	.014**
Investor characteristics								
Length of relationship with the bank	Years since account opening	7.2	8.1	1,087	7.6	8.9	5,869	.000***
Risky share *(08/2005)*	%	81.6	85.5	761	95.5	86.1	4,418	.651
Risky share *(03/2010)*	%	78.0	86.8	1050	73.4	82.2	5,381	.000***
Portfolio characteristics								
Average risky portfolio value *(08/2005 - 03/2010)*	€ thousands	60.8	42.5	1,087	51.1	34.8	5,869	.000***
Average number of trades *(08/2005 - 03/2010)*	Trades per month	2.3	1.5	1087	1.8	1.0	5,869	.000***
Average portfolio turnover *(08/2005 - 03/2010)*	%, monthly	6.1	3.7	1087	6.0	3.2	5,869	.779
Alpha (*net*) MSCI World All Country *(08/2005 - 03/2010)*	%, yearly	-2.4	-1.0	1087	-2.1	-0.9	5,869	.816
Alpha (*net*) CDAX *(08/2005 - 03/2010)*	%, yearly	-3.2	-2.3	1087	-3.9	-2.8	5,869	.286

Table V

Who uses ETFs? A probit test

Table V reports the marginal effects of a probit regression. The dependent variable for the probit regression is a dummy (*Dummy user*) that is set to one for individual investors that held at least one ETF within the sample period. For the estimation of the probit model, our independent variables are time-invariant or measured at the beginning (*08/2005*) of our sample period or at the first day (*first day*) an investor enters our sample. The independent variables are the following: a dummy that is equal to 1 if a client is male (*Dummy male*), the age of a client (*Age*), a dummy that is equal to 1 if a client falls into categories 1 to 3 of a micro-geographic status rating by an external agency (*Dummy low wealth*), a dummy that is equal to 1 if a client falls into categories 7 to 9 of the micro-geographic status (*Dummy high wealth*), years the client has been with the bank (*Length of relationship*), the risky portfolio value in Euros of the investor (L*og portfolio value*) and the proportion of risky assets in the account (*Risky share*). Heteroscedasticity robust p-values are in parentheses. The number of observations and pseudo R-squared values are reported as well. Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less.

	Dummy user			
	(1)	(2)	(3)	(4)
Dummy male	-0.012	-0.012	-0.006	-0.013
	(0.299)	(0.288)	(0.579)	(0.320)
Age *(08/2005)*	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Dummy low wealth *(08/2005)*	-0.009	-0.009	-0.010	-0.012
	(0.649)	(0.648)	(0.610)	(0.588)
Dummy high wealth *(08/2005)*	0.015*	0.015*	0.014	0.005
	(0.097)	(0.099)	(0.115)	(0.599)
Log portfolio value *(first day)*		0.003	0.006**	0.015***
		(0.276)	(0.029)	(0.001)
Length of relationship *(08/2005)*			-0.005***	-0.002
			(0.001)	(0.505)
Risky share *(08/2005)*				-0.000
				(0.603)
Observations	6,956	6,952	6,952	5,177
Pseudo-R^2	0.00466	0.00485	0.00682	0.00616

Table VI

Does the use of ETFs improve portfolio performance?

Table VI reports estimates of a panel regression where the dependent variable is net return of an investor (model 1) or excess net return of an investor (models 2 through 7). Here excess net return is excess over the 3 month Euribor rate. The regression is estimated with year and investor fixed effects and time-varying investor characteristics. The independent variable of interest is *Use of ETFs*, which is set to one if an investor holds an ETF on day t. The other independent variables are the time-varying risk factors (MSCI ACWI, World Bond, CDAX, German Bond, CDAX (SMB), CDAX (HML) and CDAX (MOM) and time-varying portfolio characteristics of the investor (the log of the risky portfolio value in Euros (*Log portfolio value*), the systematic risk-adjusted return (*Alpha*), portfolio turnover, and average number of trades). All these time-varying portfolio characteristics of the investor are rolling moving averages calculated on a daily basis at t=0 over the prior 126 days from t-1 to t-126 (*126 days MA*). *"Alpha (net)126 days MA"* comes from a regression of excess net portfolio returns on the German benchmark index CDAX in the t-126 to t-1 window, and is estimated separately for each investor. Standard errors are clustered by date and are robust to heteroscedasticity. P-values are shown in parentheses. Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less. The numbers of observations and investors, as well as R-squares are reported.

	Performance						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Net return	Excess net return	Excess net return	Excess net return	Excess net return	Excess net return	Excess net return
Use of ETFs	-2.102	-2.681	-1.568	-4.777	-4.819	-5.199	-5.163
	(0.687)	(0.513)	(0.678)	(0.202)	(0.197)	(0.161)	(0.164)
MSCI World All Country excess return		0.879***	0.788***				
		(0.000)	(0.000)				
World bond index excess return			-0.854***				
			(0.000)				
CDAX excess return				0.741***	0.743***	0.771***	0.770***
				(0.000)	(0.000)	(0.000)	(0.000)
German bond index excess return					0.079		-0.077
					(0.580)		(0.599)
CDAX (SMB)						0.120*	0.122*
						(0.052)	(0.054)
CDAX (HML)						-0.053	-0.052
						(0.346)	(0.358)
CDAX (MOM)						-0.159***	-0.161***
						(0.000)	(0.000)
Log portfolio value 126 days MA	0.684	0.912	1.232	1.731	1.760	2.391**	2.372**
	(0.680)	(0.464)	(0.291)	(0.123)	(0.117)	(0.039)	(0.041)
Alpha (net) 126 days MA	-0.244	-0.201	-0.200	-0.314**	-0.314**	-0.356**	-0.356**
	(0.409)	(0.264)	(0.180)	(0.044)	(0.044)	(0.013)	(0.013)
Portfolio turnover 126 days MA	-124.806	-126.337	-137.421	-132.717	-132.312	-136.456	-136.925
	(0.296)	(0.261)	(0.214)	(0.236)	(0.237)	(0.220)	(0.218)
Average number of trades 126 days MA	-48.278**	-40.928***	-47.888***	-37.395***	-37.348***	-38.690***	-38.742***
	(0.010)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	5.017	-0.460	-7.130	-7.392	-7.285	-3.098	-3.148
	(0.694)	(0.948)	(0.307)	(0.185)	(0.196)	(0.602)	(0.595)
Observations	5,984,911	5,984,911	5,984,911	5,984,911	5,984,911	5,984,911	5,984,911
Number of investors	6,729	6,729	6,729	6,729	6,729	6,729	6,729
R-squared	0.00403	0.258	0.289	0.296	0.296	0.302	0.302
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Investor fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table VII

Are ETFs responsible for the deterioration in portfolio performance? Split portfolio analysis

Table VII summarizes results from a split portfolio analysis. Panel A displays results after transaction costs, whereas Panel B presents results before transaction costs. Portfolio # 0 is the full portfolio of investors without any changes to securities traded or to the trading strategy. Portfolio # 1 is the non-ETF part of the portfolio of investors. Portfolio # 2 is the ETF part of the portfolio of investors. The following performance metrics are used: Return (*Return*) and its respective standard deviation (*Standard deviation*), the ratio of excess returns and excess standard deviations (*Sharpe ratio*), and measures based on a one factor model of performance evaluation using the MSCI ACWI as index. *Alpha* represents Jensen's alpha, *beta* is the coefficient on the market factor and *unsystematic variance share* is the variance the model is unable to explain. The column *delta to full portfolio* is the difference in returns between # 0 portfolio and the respective # 1 or # 2 portfolio. The *p-value* tests whether the delta is statistically different from zero using standard errors clustered at the calendar date.

Portfolio Number	Securities considered	Return p. a.	Standard Deviation	Sharpe Ratio	Alpha p. a.	p-Value	Beta	Unsystematic Variance Share	Observations	Delta to Full portfolio	p-Value to Full portfolio
PANEL A: NET RETURNS											
#0	All securities	-2.5191	0.4739	-5.3153	-4.3644	0.3410	0.6676	0.6324	737,637	0.0000	n.a.
#1	No ETFs	-2.4465	0.4826	-5.0690	-4.2497	0.3518	0.6703	0.6467	737,637	0.0697	0.4494
#2	ETFs	-3.4666	0.5431	-6.3825	-5.5250	0.2712	0.6568	0.7035	737,637	-0.8912	0.1360
PANEL B: GROSS RETURNS											
#0	All securities	-1.5140	0.4736	-3.1966	-3.3612	0.4631	0.6670	0.6321	737,637	0.0000	n.a.
#1	No ETFs	-1.4284	0.4823	-2.9615	-3.2331	0.4785	0.6697	0.6465	737,637	1.0000	0.5576
#2	ETFs	-2.4303	0.5427	-4.4782	-4.4925	0.3707	0.6561	0.7032	737,637	2.0000	0.5600

Table VIII

Are ETFs responsible for the deterioration in portfolio performance? Counterfactual analysis of the ETF part of the portfolio

Table VIII summarizes results from a counterfactual analysis for the ETF part of the portfolio. Panel A displays results after transaction costs, whereas Panel B presents results before transaction costs. Counterfactual portfolios are created by either changing the securities considered or the trading strategy. As in Table VII, portfolio # 1 is the non-ETF part of the portfolio of investors and portfolio # 2 is the ETF part of the portfolio of investors. In counterfactual portfolio #3, “B&H”, we disregard all ETF sell transactions. In counterfactual portfolio #4, “First buy B&H”, each investor only buys and holds the first ETF ever purchased. In counterfactual portfolio #5, “ETF trades in MSCI”, each ETF transaction is substituted with a transaction in a Vanguard fund which tracks the MSCI World. Counterfactual portfolios #6, “B&H in MSCI” and #7, “First buy B&H in MSCI” mimic the counterfactual portfolios #3 and #4, where we replace the individuals’ ETFs with the Vanguard MSCI World fund. The following performance metrics are used: Return (*Return*) and its respective standard deviation (*Standard deviation*), the ratio of excess returns and excess standard deviations (*Sharpe ratio*), and measures based on a one factor model of performance evaluation using the MSCI ACWI as index. *Alpha* represents Jensen’s alpha, *beta* is the coefficient on the market factor and *unsystematic variance share* is the variance the model is unable to explain. The column *delta to ETF part* is the difference in returns between the ETF part of the portfolio and the respective counterfactual portfolio. The *p-value* tests whether the delta is statistically different from zero using standard errors clustered at the calendar date.

Portfolio Number	Securities considered	Return p. a.	Standard Deviation	Sharpe Ratio	Alpha p. a.	p-Value	Beta	Unsystematic Variance Share	Observations	Delta to ETF part	p-Value to ETF part
					PANEL A: NET RETURNS						
#1	No ETFs	-2.4465	0.4826	-5.0690	-4.2497	0.6703	0.6703	0.6467	737,637	0.9609	0.486
#2	ETFs	-3.4666	0.5431	-6.3825	-5.5250	0.6568	0.6568	0.7035	737,637	0.0000	n.a.
#3	B&H	-0.8809	0.5299	-1.6624	-3.3769	0.508	0.5891	0.7236	737,637	2.4240	0.029
#4	First buy B&H	-0.3335	0.5461	-0.6106	-2.9528	0.559	0.5878	0.7324	737,637	2.9972	0.009
#5	ETF trades in MSCI	-3.2448	0.4306	-7.5359	-4.8685	0.061	0.7966	0.5004	737,637	0.3378	0.930
#6	B&H in MSCI	-1.8267	0.3544	-5.1546	-3.0739	0.314	0.9270	0.1454	737,637	1.9565	0.759
#7	First buy B&H in MSCI	-1.6634	0.3554	-4.6808	-2.9031	0.340	0.9272	0.1498	737,637	2.1205	0.739
					PANEL B: GROSS RETURNS						
#1	No ETFs	-1.4284	0.4823	-2.9615	-3.2331	0.478	0.6697	0.6465	737,637	0.9427	0.494
#2	ETFs	-2.4303	0.5427	-4.4782	-4.4925	0.371	0.6561	0.7032	737,637	0.0000	n.a.
#3	B&H	-0.7117	0.5298	-1.3432	-3.2077	0.530	0.5890	0.7235	737,637	1.5577	0.161
#4	First buy B&H	-0.2811	0.5461	-0.5147	-2.9005	0.566	0.5877	0.7325	737,637	2.0140	0.081
#5	ETF trades in MSCI	-2.2388	0.4302	-5.2044	-3.8658	0.136	0.7961	0.4997	737,637	0.3076	0.936
#6	B&H in MSCI	-1.6194	0.3554	-4.5570	-2.8591	0.341	0.9272	0.1497	737,637	1.1290	0.859
#7	First buy B&H in MSCI	-1.6194	0.3554	-4.5570	-2.8591	0.347	0.9272	0.1497	737,637	1.1290	0.859

Table IX

Are ETFs responsible for the deterioration in portfolio performance? Counterfactual analysis of the full portfolio

Table IX summarizes results from a counterfactual analysis for the full portfolio. Panel A displays results after transaction costs, whereas Panel B presents results before transaction costs. Counterfactual portfolios are created by either changing the securities considered or the trading strategy. As in Table VII, portfolio # 1 is the non-ETF part of the portfolio of investors and portfolio # 2 is the ETF part of the portfolio of investors. In counterfactual portfolio #3, "B&H", we disregard all ETF sell transactions. In counterfactual portfolio #4, "First buy B&H", each investor only buys and holds the first ETF ever purchased. In counterfactual portfolio #5, "ETF trades in MSCI", each ETF transaction is substituted with a transaction in a Vanguard fund which tracks the MSCI World. Counterfactual portfolios #6, "B&H in MSCI" and #7, "First buy B&H in MSCI" mimic the counterfactual portfolios #3 and #4, where we replace the individuals' ETFs with the Vanguard MSCI World fund. The following performance metrics are used: Return (*Return*) and its respective standard deviation (*Standard deviation*), the ratio of excess returns and excess standard deviations (*Sharpe ratio*), and measures based on a one factor model of performance evaluation using the MSCI ACWI as index. *Alpha* represents Jensen's alpha, *beta* is the coefficient on the market factor and *unsystematic variance share* is the variance the model is unable to explain. The column *delta to full portfolio* is the difference in returns between the full portfolio and the respective counterfactual portfolio. The *p-value* tests whether the delta is statistically different from zero using standard errors clustered at the calendar date.

Portfolio Number	Securities considered	Return p. a.	Standard Deviation	Sharpe Ratio	Alpha p. a.	p-Value	Beta	Unsystematic Variance Share	Observations	Delta to Full portfolio	p-Value to Full portfolio
					PANEL A: NET RETURNS						
#0	All securities	-2.5191	0.4739	-5.3153	-4.3644	0.3410	0.6676	0.6324	737,637	0.0000	n.a.
#1	No ETFs	-2.4465	0.4826	-5.0690	-4.2497	0.3518	0.6703	0.6467	737,637	0.0697	0.449
#2	ETFs	-3.4666	0.5431	-6.3825	-5.5250	0.2712	0.6568	0.7035	737,637	-0.8912	0.136
#3	B&H	-1.9422	0.4518	-4.2986	-3.8862	0.398	0.6588	0.5981	737,637	0.5688	0.028
#4	First buy B&H	-1.9273	0.4427	-4.3540	-3.8771	0.399	0.6535	0.5867	737,637	0.5685	0.136
#5	ETF trades in MSCI	-2.4353	0.4671	-5.2137	-4.2335	0.325	0.6819	0.6198	737,637	0.0946	0.810
#6	B&H in MSCI	-2.2170	0.4423	-5.0126	-3.9335	0.329	0.7063	0.5610	737,637	0.3622	0.617
#7	First buy B&H in MSCI	-2.0182	0.4243	-4.7565	-3.6975	0.322	0.7207	0.5223	737,637	0.5688	0.614
					PANEL B: GROSS RETURNS						
#0	All securities	-1.5140	0.4736	-3.1966	-3.3612	0.4631	0.6670	0.6321	737,637	0.0000	n.a.
#1	No ETFs	-1.4284	0.4823	-2.9615	-3.2331	0.4785	0.6697	0.6465	737,637	1.0000	0.558
#2	ETFs	-2.4303	0.5427	-4.4782	-4.4925	0.3707	0.6561	0.7032	737,637	2.0000	0.560
#3	B&H	-1.1717	0.4425	-2.6480	-3.1226	0.4969	0.6531	0.5865	737,637	0.3193	0.402
#4	First buy B&H	-1.1282	0.4516	-2.4983	-3.0736	0.5035	0.6584	0.5980	737,637	0.3778	0.144
#5	ETF trades in MSCI	-1.4344	0.4668	-3.0729	-3.2345	0.4516	0.6812	0.6196	737,637	0.0904	0.818
#6	B&H in MSCI	-1.2584	0.4241	-2.9672	-2.9390	0.4305	0.7202	0.5221	737,637	0.3237	0.774
#7	First buy B&H in MSCI	-1.3923	0.4420	-3.1497	-3.1105	0.4402	0.7058	0.5608	737,637	0.1819	0.802

INTERNET APPENDIX

for

Abusing ETFs

Does the Use of ETFs Improve Users' Portfolio Performance:

A Test Using a Matching Methodology

We now address the most important question of our study "do users benefit from ETFs?" with a different methodology: a matching methodology. In the main text we use the full panel structure of our dataset to answer this question. Here we only consider investors who first use an ETF in the time period from August 2006 to March 2009 (switch period). This criterion results in a sample of 4,095 customers, of which 429 traded at least one ETF in the period from August 2006 to March 2009, and 3,666 non-users who did not trade any ETF in the period from August 2005 to March 2010. The period from August 2005 to August 2006 is thus a clean period before switches, a period we will use for matching and generating other control variables. The period from March 2009 to March 2010 is a clean period after switches, a period we need to measure portfolio performance.

Figure 1 provides a time line.

[INSERT FIGURE A1 ABOUT HERE]

We also require, as in Barber and Odean (2002), that the investors have a position in each month of the study period.

Table A1 gives the results of a probit test in which the dependent variable is set to one if an investor opted to use ETFs at least once. The independent variables are either static (e.g., our socio-demographic variables) or measured over the pre-switch clean period (see Figure A1). This approach is necessary because investors do not switch all at once but at different times over a longer period. This avoids potential spurious inferences. The F-test in Table A-1 shows statistical significance, suggesting that the independent variables do distinguish between these two groups. Table A1 also tells us that those who will become users are more likely to be female, younger, trade more often, and have higher portfolio values. Their idiosyncratic variance share and their portfolio performance is also higher, but not significantly so.

[INSERT TABLE A1 ABOUT HERE]

The key question is what occurs after use. Hence, we compare the portfolio characteristics of users before and after the first use with a matched sample of non-users. In formal terms, we use a matched-pair design in calendar-time and measure the difference-in-difference before and after. The details of the matching procedure are as follows. A user is matched to a unique non-user using all significant variables from table A1: gender, age, log portfolio value, and number of trades. Additionally, we match on alpha computed separately for each investor against the CDAX benchmark as we want the alpha difference between the control and the treatment group before the treatment to be similar. This is to ensure that if we get a result in the diff-in-diff, the result comes from the difference after treatment and not before treatment. Note again that the matching variables are all computed in the pre-switch clean period.

Table A2 in this appendix is a test of the quality of the match. The difference in this table compared to Table A1 is that instead of all investors who have a position statement in every month of our sample period, we only include all users and all matched investors in this regression. Table A2 reveals that our match is not bad. The F-test shows no statistical significance, suggesting that these independent variables no longer distinguish between these two groups (see Sianesi 2004).

[INSERT TABLE A2 ABOUT HERE]

As in Barber and Odean (2002) and Seasholes and Zhu (2010), we now construct portfolios in calendar-time. The analysis is in calendar-time to mitigate any problems of cross-correlation.[27] Two distinct time series of returns for users are constructed. On each calendar day, we calculate the average of the daily returns of the investors who have not yet bought their first ETF and the average of the daily returns of the investors after they have bought their first ETF. For the sample of matched investors, we construct two analogous time series of returns.

For these time-series, we compute a number of widely used and accepted performance measures: raw returns, market-adjusted returns, 1-factor alphas (Jensen's (1968) alphas), and Carhart 4-factor alphas.

Table A3 reports the results of the difference-in-difference test.

[INSERT TABLE A3 ABOUT HERE]

In Table A3, we note that no matter how we measure the change in portfolio performance – raw return, market-adjusted return (MSCI or CDAX), 1-factor alpha (MSCI or CDAX), or 4-factor alpha (CDAX) – the differences in differences are negative for raw return, market adjusted return, and all alphas (the risk-adjusted returns) but the CDAX 4-factor alpha.[28]

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[27] Papers by Fama (1998) and Mitchell and Stafford (2000) argue strongly in favor of the calendar-time approach. Seasholes and Zhu (2010) lay out four advantages of the calendar time approach that are particularly relevant in our case: calendar time portfolios do not suffer from cross-correlation problems, dampen the effect of small stocks on returns, allow the study of geographic effects, and use a data set's entire time series. However, calendar-time approaches are also criticized in the literature. Loughran and Ritter (2000) note that in unbalanced panels the calendar-time approach underweights observations from periods with a large number of observations and over-weights observations from periods with a small number of observations. Loughran and Ritter (2000) argue that "tests that weight firms equally should have more power than tests that weight each time period equally." In our case, results from the two approaches may differ because the number of investors who switch to ETfs increase over time.

[28] The reason that the difference-in-difference point estimates are identical for three variables – the raw return, market-adjusted return MSCI and market-adjusted return CDAX – is that we are subtracting the same constant – market return – to obtain the last two variables from the first.

As to which variable(s) to use for matching is debatable, for further robustness, we also match a user to a non-user with a similar size of portfolio, as in Barber and Odean (2002).

[INSERT TABLES A4 and A5 ABOUT HERE]

Tables A4 and A5 are the counterparts to tables A2 and A3, respectively. In table A5 the deterioration of performance for users of ETFs in all alpha models is bigger than -4% and highly statistically significant. So the results of this alternate match on portfolio size are even more negative for the users of ETFs than the results of the previous match.

Our conclusion is that individual investors do not improve their portfolio performance after using ETFs. This is the same conclusion drawn from section III and table VI in the main text.

Figure A1

Time line

The figure presents the sequence of relevant events for the matched pair analysis of the effects of ETFs on individual investors' portfolios (dates are always at the end of the respective month)

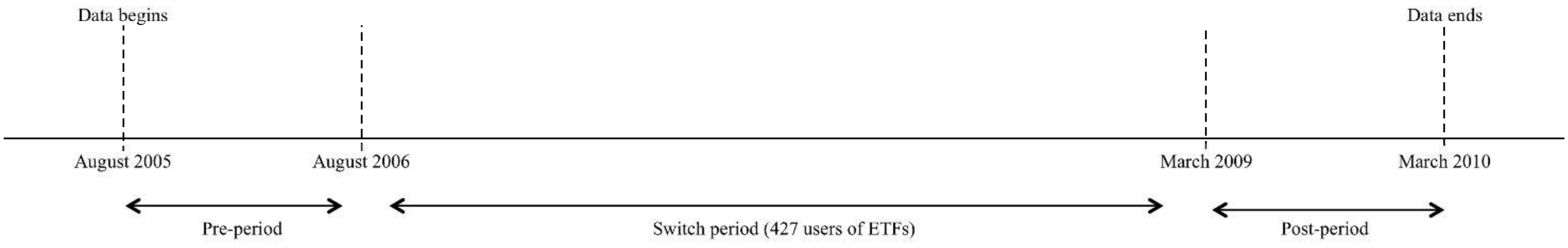

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Table A1

Who uses ETFs? A probit test for all users and non-users

Table A1 reports the marginal effects of a probit regression. The dependent variable for the probit regression is a dummy (*Dummy user*) that is set to one for clients that held at least one ETF within the sample period. All investors for which we have position statements in every month of our sample period are included in this regression. For the estimation of the probit model, our independent variables are time-invariant or measured either at the beginning (*08/2005*) of our sample period or within the first year (*08/2005 - 08/2006*) before the first use of an ETF by an investor. The independent variables are the following: a dummy that is equal to 1 if a client is male (*Dummy male*), the age of a client (*Age*), a dummy that is equal to 1 if a client falls into categories 1 to 3 of a micro-geographic status rating by an external agency (*Dummy low wealth*), a dummy that is equal to 1 if a client falls into categories 7 to 9 of the micro-geographic status (*Dummy high wealth*), years the client has been with the bank (*Length of relationship*), the average risky portfolio value of the customer (*Average log portfolio value*), the proportion of risky assets in the account (*Risky share*), the number of trades per month (*Average number of trades*), the average volume per trade in € (*Average turnover per trade in €*), the average portfolio turnover per month (*Portfolio turnover*), the market-adjusted return measured against the CDAX (*Average market-adjusted return*) and the idiosyncratic variance share (*Idiosyncratic variance share*). The idiosyncratic variance share stems from applying a 1-factor Jensen model calibrated for Germany and estimated separately for each investor. Heteroscedasticity robust p-values are in parentheses. The pseudo R-squared values and number of observations are reported as well. Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less.

	Dummy user				
Dependent variable	(1)	(2)	(3)	(4)	(5)
Demographics					
Dummy male	-0.021	-0.022	-0.023*	-0.023*	-0.023*
	(0.132)	(0.107)	(0.094)	(0.095)	(0.094)
Age	-0.001***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)
Dummy low wealth	-0.002	-0.001	-0.001	-0.000	-0.001
	(0.924)	(0.954)	(0.977)	(0.987)	(0.952)
Dummy high wealth	0.004	0.003	0.005	0.005	0.005
	(0.696)	(0.725)	(0.621)	(0.624)	(0.605)
Investor characteristics					
Length of relationship		0.002	0.002	0.002	0.002
		(0.462)	(0.437)	(0.415)	(0.402)
Average log portfolio value *(08/2005 - 08/2006)*		0.013***	0.008	0.007	0.009*
		(0.006)	(0.106)	(0.164)	(0.080)
Risky share *(08/2005)*		-0.000	-0.000	-0.000	-0.000
		(0.356)	(0.327)	(0.371)	(0.366)
Average number of trades *(08/2005 - 08/2006)*			0.005***	0.005***	0.005***
			(0.001)	(0.001)	(0.002)
Average turnover per trade in € *(08/2005 - 08/2006)*			0.000	0.000	0.000
			(0.120)	(0.130)	(0.183)
Portfolio turnover *(08/2005 - 08/2006)*			-0.132	-0.127	-0.141
			(0.202)	(0.219)	(0.175)
Portfolio characteristics					
Market-adjusted return *(08/2005 - 08/2006)*				8.159	8.859
				(0.120)	(0.109)
Idiosyncratic variance share *(08/2005 - 08/2006)*					0.000
					(0.104)
Observations	4,095	4,095	4,095	4,095	4,095
Pseudo-R^2	0.00479	0.00889	0.0129	0.0135	0.0145
F-test		0.00515	0.000163	0.000155	6.79e-05

Table A2

Who uses ETFs? A probit test for all users and their matched non-users

Table A2 reports the marginal effects of a probit regression. The dependent variable for the probit regression is a dummy (*Dummy user*) that is set to 1 for clients that held at least one ETF within the sample period. The difference in this table compared to Table A1 is that instead of including all investors who have a position statement in every month of our sample period, we only include all users and all matched investors. The match is based on all significant variables from table A1 and alpha. For the estimation of the probit model, our independent variables are time-invariant or measured either at the beginning (*08/2005*) of our sample period or within the first year (*08/2005 - 08/2006*) before the investor's first use of an ETF. The independent variables are the following: a dummy that is equal to 1 if a client is male (*Dummy male*), the age of a client (*Age*), a dummy that is equal to 1 if a client falls into categories 1 to 3 of a micro-geographic status rating by an external agency (*Dummy low wealth*), a dummy that is equal to 1 if a client falls into categories 7 to 9 of the micro-geographic status (*Dummy high wealth*), years the client has been with the bank (*Length of relationship*), the average risky portfolio value of the customer (*Average log portfolio value*), the proportion of risky assets in the account (*Risky share*), the number of trades per month (*Average number of trades*), the average volume per trade in € (*Average turnover per trade in €*), the average portfolio turnover per month (*Portfolio turnover*), the market-adjusted return measured against the CDAX (*Average market-adjusted return*) and the idiosyncratic variance share (*Idiosyncratic variance share*). The idiosyncratic variance share stems from applying a 1-factor Jensen model calibrated for Germany and estimated separately for each investor. Heteroscedasticity robust p-values are in parentheses. The pseudo R-squared values and number of observations are reported as well. Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less.

	Dummy user				
Dependent variable	(1)	(2)	(3)	(4)	(5)
Demographics					
Dummy male	0.023	0.017	0.018	0.018	0.019
	(0.597)	(0.705)	(0.687)	(0.688)	(0.671)
Age	0.001	0.001	0.001	0.001	0.001
	(0.337)	(0.452)	(0.468)	(0.477)	(0.446)
Dummy low wealth	0.106	0.106	0.106	0.104	0.098
	(0.182)	(0.182)	(0.184)	(0.189)	(0.218)
Dummy high wealth	-0.009	-0.008	-0.007	-0.005	-0.004
	(0.797)	(0.828)	(0.840)	(0.892)	(0.916)
Investor characteristics					
Length of relationship		0.007	0.006	0.006	0.006
		(0.373)	(0.400)	(0.413)	(0.411)
Average log portfolio value *(08/2005 - 08/2006)*		0.006	0.000	0.005	0.010
		(0.695)	(0.998)	(0.805)	(0.593)
Risky share *(08/2005)*		-0.000	-0.000	-0.000	-0.000
		(0.800)	(0.832)	(0.795)	(0.799)
Average number of trades *(08/2005 - 08/2006)*			0.003	0.002	0.001
			(0.602)	(0.703)	(0.822)
Average turnover per trade in € *(08/2005 - 08/2006)*			0.000	0.000	0.000
			(0.397)	(0.451)	(0.467)
Portfolio turnover *(08/2005 - 08/2006)*			-0.262	-0.220	-0.241
			(0.454)	(0.530)	(0.490)
Portfolio characteristics					
Market-adjusted return *(08/2005 - 08/2006)*				-38.168	-39.076
				(0.229)	(0.221)
Idiosyncratic variance share *(08/2005 - 08/2006)*					0.001
					(0.269)
Observations	858	858	858	858	858
Pseudo-R^2	0.00236	0.00322	0.00405	0.00528	0.00633
F-test		0.799	0.902	0.852	0.829

Table A3

Does the use of ETFs improve portfolio performance? A difference-in-difference test in calendar-time

Table A3 reports performance measures for 427 users of ETFs and their matched neighbors for the periods before and after they begin using ETFs. The match is based on all significant variables from table A1 and alpha. The differences between the users and their matches are compared before and after. The last column reports the difference-in-differences between before and after. The performance metrics provided in this table are calculated in calendar-time. For each day, we calculate the average return for users who have not yet started to use ETFs and for users who have already started to use ETFs, thereby constructing two equally weighted portfolio return series that are representative of an average investor within each group. Equivalent average returns are calculated for users' matched neighbors. Metrics provided are measures of overall performance. Raw returns are annualized daily returns. Market-adjusted returns are raw returns minus the return of a benchmark, MSCI or CDAX. We further report 1-factor alphas for the MSCI ACWI and the CDAX as well as 4-factor alphas for the CDAX. P-values are reported in the line below the respective metric. Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less.

	Before			After			After - before
Metric	User	Matched	Difference (user less match)	User	Matched	Difference (user less match)	Difference
Returns *(%, annual)*							
Raw return	-7.55	-7.82	0.27	-1.30	-0.46	-0.84	-1.11
			.946			.731	.814
Market-adjusted return MSCI	-1.10	-1.37	0.27	-1.34	-0.50	-0.84	-1.11
	.873	.833	.946	.830	.932	.731	.814
Market-adjusted return CDAX	2.08	1.81	0.27	0.27	1.11	-0.84	-1.11
	.747	.789	.946	.963	.858	.731	.814
Overall alpha *(%, annual)*							
MSCI 1-factor	-4.83	-4.15	-0.68	-3.79	-2.75	-1.04	-0.36
	.523	.603	.713	.613	.744	.492	.850
CDAX 1-factor	-5.14	-4.43	-0.71	-2.63	-1.41	-1.21	-0.50
	.337	.504	.770	.740	.870	.338	.796
CDAX 4-factor	0.72	2.04	-1.32	-0.55	0.46	-1.01	0.31
	.790	.710	.662	.902	.923	.510	.929

Table A4

Who uses ETFs? A probit test (match based on portfolio size)

Table A4 reports the marginal effects of a probit regression. The dependent variable for the probit regression is a dummy (*Dummy user*) that is set to 1 for clients that held at least one ETF within the sample period. The difference in this table compared to Table A1 is that instead of including all investors who have a position statement in every month of our sample period, we only include all users and all matched investors, where the match is based on portfolio size. For the estimation of the probit model, our independent variables are time-invariant or measured either at the beginning (*08/2005*) of our sample period or within the first year (*08/2005 - 08/2006*) before the investor's first use of an ETF. The independent variables are the following: a dummy that is equal to 1 if a client is male (*Dummy male*), the age of a client (*Age*), a dummy that is equal to 1 if a client falls into categories 1 to 3 of a micro-geographic status rating by an external agency (*Dummy low wealth*), a dummy that is equal to 1 if a client falls into categories 7 to 9 of the micro-geographic status (*Dummy high wealth*), years the client has been with the bank (*Length of relationship*), the average risky portfolio value of the customer (*Average log portfolio value*), the proportion of risky assets in the account (*Risky share*), the number of trades per month (*Average number of trades*), the average volume per trade in € (*Average turnover per trade in €*), the average portfolio turnover per month (*Portfolio turnover*), the market-adjusted return measured against the CDAX (*Average market-adjusted return*) and the idiosyncratic variance share (*Idiosyncratic variance share*). The idiosyncratic variance share stems from applying a 1-factor Jensen model calibrated for Germany and estimated separately for each investor. Heteroscedasticity robust p-values are in parentheses. The pseudo R-squared values and number of observations are reported as well. Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less.

	Dummy user				
Dependent variable	(1)	(2)	(3)	(4)	(5)
Demographics					
Dummy male	-0.080*	-0.082*	-0.082*	-0.083*	-0.081*
	(0.084)	(0.082)	(0.084)	(0.082)	(0.089)
Age	-0.004***	-0.005***	-0.005***	-0.005***	-0.004***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.004)
Dummy low wealth	-0.113	-0.116*	-0.118*	-0.117*	-0.130*
	(0.102)	(0.092)	(0.086)	(0.095)	(0.060)
Dummy high wealth	-0.025	-0.026	-0.024	-0.025	-0.024
	(0.486)	(0.464)	(0.498)	(0.486)	(0.499)
Investor characteristics					
Length of relationship		0.004	0.003	0.004	0.005
		(0.583)	(0.651)	(0.607)	(0.507)
Average log portfolio value *(08/2005 - 08/2006)*		0.016	0.004	-0.005	0.005
		(0.309)	(0.812)	(0.780)	(0.770)
Risky share *(08/2005)*		-0.001	-0.001	-0.001	-0.001
		(0.171)	(0.133)	(0.124)	(0.105)
Average number of trades *(08/2005 - 08/2006)*			0.017**	0.018***	0.016**
			(0.010)	(0.008)	(0.015)
Average turnover per trade in € *(08/2005 - 08/2006)*			0.000	0.000	0.000
			(0.726)	(0.545)	(0.686)
Portfolio turnover *(08/2005 - 08/2006)*			-0.498	-0.425	-0.485
			(0.177)	(0.248)	(0.194)
Portfolio characteristics					
Market-adjusted return *(08/2005 - 08/2006)*				94.050**	104.651***
				(0.011)	(0.006)
Idiosyncratic variance share *(08/2005 - 08/2006)*					0.002**
					(0.023)
Observations	858	858	858	858	858
Pseudo-R^2	0.0112	0.0136	0.0197	0.0255	0.0299
F-test		0.0302	0.0130	0.00314	0.00116

Table A5

Does the use of ETFs improve portfolio performance? A difference-in-differences test in calendar-time (match based on portfolio size)

Table A5 reports performance measures for 427 users of ETFs and their matched neighbors for the periods before and after they begin using ETFs. The match is based on portfolio size. The differences between the users and their matches are compared before and after. The last column reports the difference-in-differences between before and after. The performance metrics provided in this table are calculated in calendar-time. For each day, we calculate the average return for users who have not yet started to use ETFs and for users who have already started to use ETFs, thereby constructing two equally weighted portfolio return series that are representative of an average investor within each group. Equivalent average returns are calculated for users' matched neighbors. Metrics provided are measures of overall performance. Raw returns are annualized daily returns. Market-adjusted returns are raw returns minus the return of a benchmark, MSCI or CDAX. We further report 1-factor alphas for the MSCI ACWI index and the CDAX as well as 4-factor alphas for the CDAX. P-values are reported in the line below the respective metric. Three stars (***) denote significance at 1% or less; two stars (**) denote significance at 5% or less; one star (*) denotes significance at 10% or less.

	Before			After			After - before
Metric	User	Matched	Difference (user less match)	User	Matched	Difference (user less match)	Difference
Returns *(%, annual)*							
Raw return	-7.55	-12.00	4.46	-1.30	0.07	-1.37	-5.83
			.280			.609	.237
Market-adjusted return MSCI	-1.10	-5.55	4.46	-1.34	0.03	-1.37	-5.83
	.873	.303	.280	.830	.996	.609	.237
Market-adjusted return CDAX	2.08	-2.38	4.46	0.27	1.64	-1.37	-5.83
	.747	.691	.280	.963	.782	.609	.237
Overall alpha *(%, annual)*							
MSCI 1-factor	-4.83	-7.39	2.56	-3.79	-2.20	-1.59	-4.15
	.523	.298	.336	.613	.753	.245	.015**
CDAX 1-factor	-5.14	-7.82	2.68	-2.63	-0.87	-1.76	-4.43
	.337	.038**	.291	.740	.908	.050**	.030**
CDAX 4-factor	0.72	-3.07	3.79	-0.55	0.36	-0.91	-4.70
	.790	.008***	.158	.902	.942	.436	.038**

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