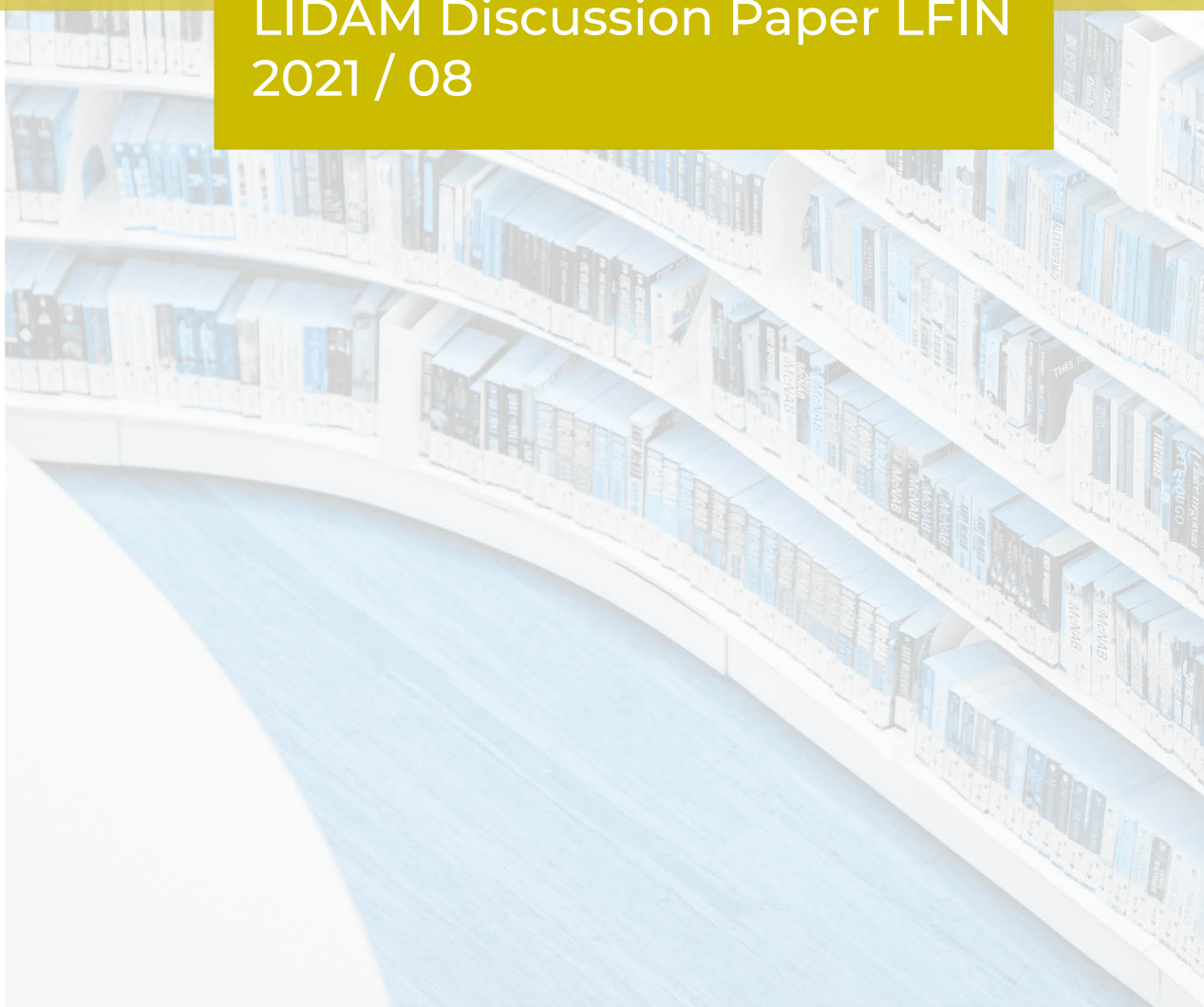
BLAMING OR PRAISING PASSIVE ETFS?

Catherine D'Hondt, Younes Elhichou Elmaya, Mikael Petitjean

LIDAM Discussion Paper LFIN
2021 / 08



UCLouvain

LFIN | LIDAM
Louvain Institute of Data Analysis and Modeling in economics and statistics

LFIN

Voie du Roman Pays 34, L1.03.01 B-1348 Louvain-la-Neuve

Tel (32 10) 47 43 04

Email: lidam-library@uclouvain.be

https://uclouvain.be/en/research-institutes/lidam/lfin/publications

Does holding passive ETFs change retail investors' trading behavior for the better?*

Catherine D'Hondt[†], Younes Elhichou Elmaya[‡], Mikael Petitjean[§]

Working paper.

May 25, 2021

Abstract

We use random matching to study the trading behaviors of retail investors who hold passive exchange traded funds invested in stocks (P-ETFs). Using both trading records and survey data to control for all the key investor characteristics, we find strong evidence that retail investors trade differently when they hold P-ETFs. They have a higher portfolio size, a lower turnover, and keep their assets for a longer period of time than the control group of retail investors who hold individual stocks only. P-ETF retail investors are also better protected against stock gambling and those among them who follow a core-satellite approach are least likely to hold lottery-like stocks.

Keywords: ETFs, stocks, Retail Investors, Passive Investing, Gambling Behavior.

JEL classification: G11, G40, G53

*The authors are grateful to the brokerage house for providing the data. Any errors are the full responsibility of the authors.

[†]Louvain Finance (LIDAM), Louvain School of Management, Catholic University of Louvain.

[‡]Louvain Finance (LIDAM), Louvain School of Management, Catholic University of Louvain. Corresponding author : – Mailing address: younes.elhichou@uclouvain.be - Adresse: Chaussée de Binche 151, 7000 Mons, BELGIUM – Tel: +32 (0)65 32 34 41.

[§]IÉSEG School of Management (LEM-CNRS 9221) and Louvain School of Management (LFIN-LIDAM, UCLouvain).

1 Introduction

Exchange Traded Funds (ETFs) have been gaining ground among institutional and retail investors since their launch in the mid 1990s. As pointed out by Cheng et al. (2018), ETFs have been heralded as 'the harbingers of a new era of low-cost/low-risk investment opportunities available to the general public'. Retail investors can indeed trade today a wide range of well-diversified, highly-liquid, low-cost funds, allowing them to apply the central tenets of modern portfolio theory.

There are many arguments in favour of investing in ETFs for households and retail investors. Poterba and Shoven (2002) find that ETFs are more tax efficient than equity mutual funds. They also offer diversified and low fee portfolios. Oehler and Wanger (2020) find that plain-vanilla ETFs are suitable instruments to enhance portfolio performance and diversification. These conclusions have been reached by many other authors (see, e.g., Malkiel, 2003; French, 2008; Huang and Lin, 2011; Jacobs et al., 2014; Bhattacharya et al., 2017). All these benefits explain the substantial shift from active to passive investing (Anadu et al., 2019).

In the literature, there are essentially macro studies that examine the flows in aggregate passive investment vehicles. Sushko and Turner (2018), Easley et al. (2018) and Cheng et al. (2018) show that both index mutual funds and ETFs exhibit high in- and outflows. Sushko and Turner (2018) also document that flows in index mutual funds are less volatile during market turmoil than those in active mutual funds, while it is the opposite for ETFs. This is related to the fact that retail investors trade ETF shares in the market, but the process of creation and redemption of shares, leading to entry and exit flows, is mostly reserved to sophisticated institutional investors (Cheng et al., 2018).

In contrast to these macro studies which underline the high degree of activeness by institutional investors, we carry out a micro analysis of investment decisions made by retail investors. Little is known about the way retail investors trade ETFs. Müller and Weber (2010) and Enete et al. (2018) find that ETF users have higher (subjective or objective) financial knowledge, compared to non-users of ETFs. Da Dalt et al. (2019) provide evidence that households adopt contrarian behaviors when they trade ETFs, but this is even more the case when they trade common stocks. They also find that positive momentum has

stronger impact on the propensity of households to purchase ETFs rather than common stocks. D'Hondt et al. (2020) find that the most active users of passive ETFs (P-ETFs hereafter) hold a lower number of stocks and modify the composition of their portfolio less extensively, pointing to a substitution effect between stocks and P-ETFs.

Some pitfalls in the use of ETFs by retail investors have also been identified. For example, Bhattacharya et al. (2017) find that retail investing in P-ETFs does not improve portfolio performance because of poor ETF timing as well as poor ETF selection. In addition to other costly biases, this poor timing and selection performance has been extensively documented in the past for stocks (e.g., De Bondt and Thaler (1985), Barber and Odean (2000), Barber et al. (2008), Barber and Odean (2013)). A large number of empirical studies has indeed pointed out that the average investor underperforms the market as a result of many behavioral biases (e.g., under-diversification, overconfidence, over-trading, disposition effect, as well as sensation seeking and gambling).

This paper makes an important contribution to the literature on household finance,[1] which is characterized by a lively debate on how households and retail investors should use financial instruments and markets to achieve their objectives (Guiso and Sodini, 2013). In contrast to Bhattacharya et al. (2017), we do not include a large, albeit heterogeneous, universe of ETFs and do not run a portfolio performance analysis. We study the portfolio composition of retail investors who hold P-ETFs to analyze their trading behavior, and use a random matching procedure to compare them to a control group of retail investors who hold stocks only.[2]

Our first objective in this paper is to investigate whether retail investors who hold P-ETFs manage their securities differently than those who invest in individual stocks only. If this is not the case, then there is evidence that holding ETFs does not 'make a change': retail investors would not grasp the contribution of passive investment vehicles for long-term investing, questioning the whole point of passive investing. In the existing literature, Müller and Weber (2010), Enete et al. (2018) and D'Hondt et al. (2020) show that retail investors

[1]The term 'Household Finance' has been coined by Campbell (2006).

[2]We only investigate passive ETFs invested in stocks, i.e., ETFs that track a basket of stocks, belonging to an index or not. We exclude leveraged, inverse, or leveraged-inverse ETFs, i.e., ETFs that have a multiplier different from 1. For an analysis of the behavior of retail investors who invest in leveraged Exchange Traded Products, please see D'Hondt et al. (2020).

who trade ETFs exhibit higher financial knowledge and experience. Thus, we expect the retail investors who trades P-ETFs to display coherent trading behaviors in line with long-term investing.

If retail investors understand the added value of P-ETFs for long-term investing, they should also be better protected against stock gambling. Our second objective is therefore to test whether holding P-ETFs protect retail investors against trading lottery-like stocks. We therefore expect a higher propensity to gamble in the control group of retail investors who hold individual stocks only.

Controlling for investor characteristics related to financial knowledge and experience, level of education and portfolio value, we clearly show that retail investors who invest in P-ETFs trade their assets differently in comparison to those who only hold stocks in their portfolio. They include more securities and take a longer-term perspective with respect to portfolio turnover and asset holding period. Among P-ETF retail investors, those who invest more than 75% of their portfolio in P-ETFs, trade stocks like in a core-satellite portfolio approach.[3]

Retail investors who hold P-ETFs are also less prone to gambling with their stocks. Holding P-ETFs in portfolio is negatively related to the investor's propensity to trade lottery-like stocks. This protection against stock gambling is highest for the retail investors who invest more than 75% of their portfolio in P-ETFs.

The rest of the paper is organized as follows. In Section 2, we describe our data and sample as well as our propensity score matching procedure. We report our empirical work in Section 3. We conclude in Section 4.

[3]Core-satellite investing is a method of portfolio construction designed to outperform the broad stock market in a specific way. The core of the portfolio consists of passive investments that track major market indices, such as the S&P500 Index. Additional positions, known as satellites, are added to the portfolio in the form of actively managed investments such as stocks.

2 Data and sample

2.1 Data

The data are provided by an online Belgian brokerage house. They are composed of two datasets. The first dataset provides detailed information about the trading activity of a selected sample of 14,134 retail investors who traded stocks only or both stocks and equity-linked P-ETFs over the period January 2003-March 2012. This dataset contains 2,613 trades on P-ETFs, where 71% are purchases and 29% are sales, involving 512 retail investors (i.e., 3.46% of the retail investors in our sample). These 512 P-ETF users traded 128 different P-ETFs. Table 1 presents the top 5 stock P-ETFs in our sample. Almost 43% of the number of trades and 46% of monetary volume are concentrated in three P-ETFs: LYXOR ETF BEL 20 tracking the Belgian BEL20 index, LYXOR ETF DJ ES50 tracking the Dow Jones Global Titans 50, and LYXOR ETF CAC40 tracking the French CAC40 index.

Table 1: The top 5 P-ETFs on equity in sample.

ETF	Number of trades	Share in %	Volume of trades in €	Share in %
LYXOR ETF BEL 20	616	23.57%	2,276,281.99	8.15%
LYXOR ETF DJ ES 50	260	9.95%	4,844,913.89	17.34%
LYXOR ETF CAC 40	244	9.34%	5,620,972.38	20.12%
LYXOR ETF CHINA	104	3.98%	1,768,459.00	6.33%
LYXOR ETF BRAZIL	99	3.79%	805,011.37	2.88%
Other (123 P-ETFs)	1,290	49.37%	12,622,368.71	45.18%
Total	2,613	100%	27,938,007.34	100%

This table reports the number of trades and monetary volume (in EUR) of the top 5 P-ETFs in our sample.

Our sample of investors made 801,656 trades on 7,132 different stocks. Unsurprisingly, they are net buyers, since 60% of the trades are purchases and 40% are sales. Table 2 presents the top 5 stocks in our sample, which represent about 20% of both the total number of trades and the total monetary volume.

Table 2: The top 5 stocks in sample.

ETF	Number of trades	Share in %	Volume of trades in €	Share in %
FORTIS	44,453	5.55%	435,646,299	6.55%
KBC	38,035	4.75%	391,576,680	5.89%
DEXIA	36,393	4.54%	312,713,163	4.70%
NYRSTAR	20,990	2.62%	118,290,778	1.78%
AGFA-GEVAERT	14,416	1.80%	95,555,536	1.44%
Other (7,127 stocks)	647,369	80.75%	5,295,868,287	79.64%
Total	801,656	100%	6,649,650,743	100%

This table reports the number of trades and monetary volume (in EUR) of the top 5 stocks in our sample.

The second dataset complements the first one by providing more qualitative information about the retail investors: (1) their sociodemographics such as year of birth, gender, level of education and spoken language,[4] (2) their answers to two MiFID questionnaires, [5] the Appropriateness test (A-test hereafter) and the Suitability test (S-test hereafter). The latter are survey data that are reported online by each investor, and since these are self-reported decisions that investors make on their own, without any interaction with a financial intermediary, and that most of them imply self-assessment, we consider these survey data as subjective variables.[6]

2.2 Treatment and control groups

The objective of our study is to find whether holding P-ETFs changes the way retail investors trade by comparing trading activity measures between two groups of investors. The first is the treatment group (TG hereafter), composed of 512 investors who invest in both individual stocks and stock P-ETFs. The second is the control group (CG hereafter), composed of 13,622 investors who only invest in stocks.

The second-last column (Diff-1) in Table 3 shows that several characteristics are significantly different between the TG and the CG (n=13,738). Comparing the trading behavior of

[4]The investors may select French, Dutch or English as interaction language.

[5]MiFID stands for the Markets in Financial Instruments Directive. MiFID I (2004/39/EC) is known as the first version of this Directive while a review of it was implemented in January 2018 (known as MiFID II (2014/65/UE)).

[6]The two questionnaires include items are usually covered in Investment Policy Statements (IPS) used in portfolio management delegation. There are some points according to Boone and Lubitz (2004) that are primordial for an IPS: 1) client goals and objectives, 2) client fears and concerns, 3) investment time frame, 4) expected outside mortality, 5) retirement time frame, 6) shorter-term financial needs, 7) risk tolerance attitudes, and 8) risk capacity. In our data, the S-test covers almost all those points.

the TG and CG as it is may therefore be tricky since many aspects of the difference between the two groups of investors can be attributed to differences in investor's characteristics, and not to P-ETFs exclusively. We need to control for differences in these characteristics when examining the effect of P-ETFs in the portfolio.

If the goal is to estimate the causal effects based on observational data, it is preferable to replicate the experiment as closely as possible by obtaining treated and control groups with similar covariate distributions (Stuart, 2010). Hence, we use the propensity score matching technique (PSM hereafter) so as to reduce the selection bias by matching our control and treated groups using propensity score probabilities estimated with a logistic regression model. Another reason is to have a similar number of investors in both groups for our comparison to be relevant.

The PSM approach is used in observational studies to reduce the selection bias by matching subjects based on the probability that they would be assigned to specific group, i.e., the goal is to construct two groups of 'comparable' TG investors and CG investors. The propensity score is computed for each investor in the sample, and is equal to the estimated probability that a retail investor would trade P-ETFs at least once during the sample period conditioned on a set of regressors, X. This probability is given by $Prob[Y = 1|X] = G(x'b)$, where G(.) is the logistic cumulative distribution function. Thus, in our logit model (1) below, we opt for a random matching procedure that controls for sociodemographics, portfolio value and subjective variables from the A-test.

$$P(Y_i = 1|SDV_i; SV_i; OV_i) = G(\beta_0 + \beta_1 SDV_i + \beta_2 SV_i + \beta_3 OV_i + \epsilon_i) \tag{1}$$

where $Y_i = PETF_i$, which is a dummy variable set to 1 if each investor i trades stock P-ETFs at least once. SDV_i is a vector of socio-demographic attributes including age, gender, level of education and spoken language of each investor i. OV_i is an objective variable measuring the portfolio value in euros of each investor i. SV_i is the vector of subjective variables based on survey-data, including financial knowledge and experience of each investor i.

To obtain a relevant estimation of the matching scores, we only keep the significant variables in the previous logistic model by following the general to specific approach with a

10% threshold. The final logistic model (2) used to estimate the matching score includes the following five independent variables:[7]

$$P(Y_i = 1|X) = G(\beta_0 + \beta_1\, English - speaking_i + \beta_2\, Higher\ education_i + \beta_3\, Knowledge\ of\ financial\ markets_i + \beta_4\, Experience\ with\ complex\ instruments_i + beta_5\, Portfolio\ value_i + \epsilon_i) \quad (2)$$

where $Y_i = PETF_i$, $English - speaking_i$ is a dummy equal to 1 if the investor i speaks English, 0 otherwise; $Higher\ education_i$ is a a dummy equal to 1 if the investor i holds a university degree or equivalent, 0 otherwise; $Knowledge\ of\ financial\ markets_i$ refers to one specific question where investors have to self-assess their knowledge of financial markets on a scale of four levels, wherein Level 0 is associated with a basic knowledge while Level 3 refers to an experienced investor 'who manages any aspect of the financial markets' ; $Experience\ with\ complex\ instruments_i$ is the investor's self-assessment regarding his/her own experience with complex instruments; and $Portfolio\ value_i$ is the portfolio value in euros of each investor i.

There are numerous ways to match individuals assigned to different groups based on propensity scores.[8] We opt for a matching based on an allowable absolute difference between exact propensity scores, i.e., based on a radius around the score matching.[9] This method allows us to end up with a sample of 511 investors in the CG.

In the last column (Diff 2) of Table 3, we can see that the use of the propensity score matching leads all the discriminant variables (e.g., Higher education, English-speaking, Knowledge of financial markets and portfolio value) to be no longer significantly different between the TG and the CG. The two groups are therefore very similar regarding sociodemographics, portfolio value, and subjective variables.

[7] Results of the logit model (2) for the propensity score matching are presented in Table 11 in Appendix.

[8] Among them, the nearest neighbor matching, radius matching, kernel matching, and interval matching.

[9] Each treated observation i is matched with control observations j as long as their absolute difference in propensity scores (PS) falls within a specified radius, r, such that $|| PS_i - \hat{PS}_j ||< r$. The lower r, the higher the level of closeness we require. In our case, r is set to 0.01. We choose the lowest radius possible to get a very similar number of observations to the TG, keeping the differences between the TG and the CG (after PSM) no longer significant.

Table 3: Descriptive statistics - before and after the propensity score matching (PSM)

		TG n = 512 (1)		CG before PSM n = 13,622 (2)		CG after PSM n = 511 (3)		t-test	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Diff-1 (1)-(2)	Diff-2 (1)-(3)
Panel A: Socio-demographics									
Age (2012)	Years	47.25	13.03	47.34	13.13	47.72	13.97	-0.093	-0.464
Gender	Dummy=1 if male	0.877	0.329	0.854	0.353	0.867	0.340	0.023	0.010
Higher education	Dummy=1 if university	0.742	0.438	0.645	0.479	0.742	0.438	0.097***	0.001
Dutch-speaking	Dummy=1 if Dutch	0.504	0.500	0.543	0.498	0.507	0.500	-0.039*	-0.003
French-speaking	Dummy=1 if French	0.398	0.490	0.412	0.492	0.399	0.490	-0.014	-0.001
English-speaking	Dummy=1 if English	0.098	0.297	0.045	0.207	0.094	0.292	0.053***	0.004
Panel B: Subjective variables	(Score Min-Max)								
Knowledge of financial markets	(score 0-3)	1.326	0.894	1.071	0.921	1.243	0.899	0.255***	0.084
Knowledge of 'complex' instruments	(score 0-18)	4.895	5.067	4.173	4.826	4.708	5.027	0.721***	0.186
Experience with 'complex' instruments	(score 0-18)	3.641	4.819	3.279	4.525	3.752	4.799	0.361*	-0.111
Awareness of the losses of 'complex' instruments	(score:0-9)	7.022	3.384	6.588	3.692	7.025	3.356	0.434***	-0.004
Panel C: Objective variables									
Portfolio value	(in €)	53,244.8	220,615	12,702.0	119,926	38,276.5	225,253	27,542.8***	14,968.3

The table reports the cross-sectional mean, standard deviation and means difference between TG and CG before and after Propensity Score Matching. Panel A includes Socio-demographics.'Age' is determined as the difference between 2012 and the year of birth. 'Gender' is a dummy variable equal to one if the investor is a male. 'Higher education' refers to the proportion of investors who declare that they hold a university degree or equivalent. 'Dutch-speaking', 'French-speaking' and 'English-speaking' refer to the proportion of investors who choose Dutch, French, and English respectively as the main language on the online brokerage trading platform. Panel B includes subjective variables and refers to the A-test. 'Knowledge of financial markets' refers to one specific question where investors have to self-assess their knowledge of financial markets on a scale of four levels, wherein Level 0 is associated with a basic knowledge while Level 3 refers to an experienced investor 'who manages any aspect of the financial markets'. For 'Knowledge of "complex" instruments', 'Experience with "complex" instruments' and 'Awareness of the losses with "complex" instruments', the score elicits the investor's self-assessment regarding his/her own abilities and skills. For example, a score of 18 out of 18 for the Knowledge of "complex" instruments means that the investor considers himself/herself as an expert in the field. Conversely, a score of 0 (out of 18) indicates that the investor declares no knowledge about "complex" instruments. Panel C includes 'Portfolio value' is the monthly average end-of-month portfolio market value in €. *,**,*** indicate that the difference is statistically significant at the level of 10%, 5% or 1%, respectively.

2.3 Behavioral comparison between the treatment and control groups

Table 4 shows that our sample of TG investors made 2,613 transactions and introduced 3,775 orders on P-ETFs, versus 32,132 trades and 47,576 orders on individual stocks. The CG investors made 30,346 stock trades and introduced 42,589 orders on stocks. Based on investors' transactions, we compute various metrics to characterize the trading activity of TG and CGs. The results are presented in Table 5.

Table 4: Number of orders and trades for TG and CG

	TG n = 512			CG n = 511
	P-ETFs	Stocks	P-ETFs & Stocks	Stocks
Total number of trades	2,613	32,132	34,745	30,346
Total number of orders	3,775	47,576	51,351	42,589

The table reports the total number of both trades and orders on stocks and P-ETFs for TG and CG.

Table 5 reports the univariate tests on mean differences in several trading activity measures between the TG and CG. For the TG investors we distinguish between their P-ETF portfolio, stock portfolio and aggregate portfolio (P-ETFs & stocks), while the CG investors' portfolio include only stocks by construction. In Panel A (Diff-4), *Number of trades* and *Trading volume* between the two groups show no significant differences when focusing on the aggregate portfolios. In contrast, the TG displays significantly higher *Trading experience*, *Number of different securities traded*, *Number of trading days*, and lower *Trade duration*.

Panel B in Table 5 reveals that the TG investors show both significantly higher *Portfolio size* and *Asset holding period ratio*. They seem to hold one average three more securities than the CG investors. They also keep their assets longer than the CG investors. However, both groups do not show significantly different trading behaviors regarding *Turnover*, *Portfolio holding period* and *Value of the portfolio*.

All TG investors trade P-ETFs at least once during the sample period, but it does not necessarily mean they behave similarly. The extent to which they use P-ETFs may lead to heterogeneous behaviours among them. We test whether their behaviors depend on the weight allocated to P-ETFs in their portfolios by creating four sub TGs (TG1, TG2, TG3 and TG4) where we cluster TG investors according to the weight of P-ETFs in their aggregate portfolio.[10] We then perform an analysis of variance (ANOVA hereafter) to investigate whether our measures of trading activity vary significantly across the four sub TGs, depending on the level of P-ETF weight in their aggregate portfolio.

[10]The goal is to identify 'light, medium and heavy users of P-ETFs' and not to obtain four balanced groups of investors (contrary to the matching procedure). We therefore do not rely on the use of quartiles where each quartile contains 25% of the TG investors by construction. In such a case, the first (second, third) quartile includes investors whose portfolio weight in P-ETFS is below 12.91%, 27.46%, and 58.83%. Using these quartiles would have prevented us from identifying 'heavy users' in particular. Results are still reported in Table 12 in the appendix.

Table 5: Univariate t-test comparisons between TG and CG investors.

		TG n = 512			CG n = 511	t-test			
Metrics		P-ETFs Mean (1)	Stocks Mean (2)	P-ETFs + Stocks Mean (3)	Stocks Mean (4)	Diff-1 (1)-(2)	Diff-2 (1)-(4)	Diff-3 (2)-(4)	Diff-4 (3)-(4)
Panel A : Trades based variables									
Number of trades		5.10	62.76	67.86	59.39	-57.65***	-54.28***	3.37	8.48
Number of purchases		3.63	39.30	42.92	35.21	-35.67***	-31.59***	4.08	7.71*
Number of sales		2.52	26.40	27.58	26.85	-23.89***	-24.34***	-0.45	0.73
Trading volume	(in €)	5,638.8	4,770.7	4,975.2	6,055.3	868.1	-416.5	-1,284.6*	-1,080.2
Buying volume	(in €)	5,522.7	4,666.5	4,829.3	5,753.9	856.3	-231.1	-1,087.4	924.6
Selling volume	(in €)	7,172.5	5,208.3	5,596.6	6,968.8	1,964.2**	203.7	-1,760.5**	-1,372.1
Trading experience	(in months)	14.09	45.59	48.08	42.52	-31.51***	-28.44***	3.07**	5.55***
Trade duration	(in days)	213.9	96.33	66.84	98.08	117.6***	-115.9***	-1.75	-31.24***
Number of different securities traded		1.65	18.23	19.88	13.38	-16.58***	-11.73***	4.85***	6.50***
Number of trading days		4.39	41.88	45.04	38.10	-37.49***	-33.71***	3.78	6.94*
Panel B : Portfolio based variables									
Portfolio size		1.31	6.25	6.94	4.00	-4.94***	-2.69***	2.25***	2.94***
Portfolio value	(in €)	12,131.6	45,766.7	53,244.8	38,276.5	-33,635.1***	-26,144.9***	7,490.2	14,968.3
Turnover		1.57	1.58	1.50	1.38	-0.01	0.18	0.20	0.12
Portfolio holding period	(in months)	29.59	57.62	59.28	57.63	-28.02***	-28.04***	-0.01	1.64
Asset holding period ratio (AHPR)		0.93	0.66	0.65	0.61	0.27***	0.32***	0.05***	0.04***

The table reports the cross-sectional mean and means differences between TG (P-ETFs, Stocks and aggregate portfolios) and CG (Stocks portfolio). For each variable under scrutiny, we report its mean for each group. Panel A includes trades based variables. 'Number of trades' is the number of trades executed over the sample period. 'Number of purchases' is the number of purchases executed over the sample period. 'Number of sales' is the number of sales executed over the sample period. 'Trading volume' is the volume in (€) of trades executed over the sample period.'Buying volume' is the volume in (€) of purchases executed over the sample period. 'Selling volume' is the volume in (€) of sales executed over the sample period. 'Trading experience' is computed as the difference between the last and the first trading dates, expressed in number of months. 'Trade duration' is computed as the average number of days between two consecutive trades. 'Number of different securities traded' is the number of different securities traded during the whole period. 'Number of trading days' is the total number of different trading days during the whole trading period. Panel B includes portfolio based variables. 'Portfolio size' is the average number of securities held in the end-of-month portfolio. 'Value of the portfolio' is the average value of the end-of-month portfolio. 'Turnover' is the average of the absolute values of all the purchases and sales in a particular month divided by the average of the portfolio values at the beginning and the end of this particular month. 'Portfolio holding period' is the number of months between the first month with non-empty portfolio, and the last month with non-empty portfolio, over the sample period (January 2003-March 2012). 'Asset holding period ratio' is asset average holding period in portfolio, expressed as percentage of 'Portfolio holding period'. *,**,*** indicate that the difference is statistically significant at the level of 10%, 5% or 1%, respectively.

Table 6 reports the ANOVA tests for all the trading activity measures. They are all significant, except for *Turnover* and *Portfolio holding period*. Panels A and B show a negative relationship between P-ETF weight and *Number of trades*, *Trading experience*, *Number of different securities traded*, *Number of trading days*, *Portfolio size* and *Portfolio value*, while this relationship is positive with *Trade duration*. There is no clear trend regarding *Trading volume* and *Asset holding period ratio* even if the differences among the four groups are significant.

Table 6: Univariate ANOVA comparisons among TG investors for the aggregate portfolio.

Weight of P-ETFs in the aggregate portfolio Number of investors	TG1 $0-25\%$ n=242 Mean	TG2 $25\%-50\%$ n=112 Mean	TG3 $50\%-75\%$ n=70 Mean	TG4 $75\%-100\%$ n=88 Mean	F-stat
Panel A : Trades based variables					
Number of trades	101.95	40.77	37.11	33.05	11.07***
Number of purchases	64.85	26.13	23.20	19.69	14.79***
Number of sales	39.91	17.26	15.71	14.51	5.99***
Trading volume	4,666.86	3,392.36	7,744.08	5,634.90	4.35***
Buying volume	4,598.70	3,238.43	7,404.02	5,439.97	3.73**
Selling volume	5,129.59	3,651.78	9,204.80	6,413.13	4.78***
Trading experience	51.30	45.80	46.40	43.43	2.87**
Trade duration	39.47	74.21	101.58	105.11	23.23***
Number of different securities traded	28.60	14.63	10.86	9.72	36.82***
Number of trading days	65.11	29.32	27.69	23.66	18.50***
Panel B : Portfolio based variables					
Portfolio size	10.33	5.15	4.12	2.14	66.19***
Portfolio value (in €)	81,109.85	27,600.41	42,392.35	17,886.93	2.63**
Turnover	2.53	0.963	0.299	0.326	0.31
Portfolio holding period (in months)	60.03	58.54	61.30	56.51	0.65
Asset holding period ratio (AHPR)	0.668	0.693	0.666	0.550	5.78***

The table reports the results for the analysis of variance (ANOVA) on the raltionship between several variables characterizing trading behavior and the weight of P-ETFs in the aggregate portfolio. For each variable under scrutiny, we report its mean for each TG-i group. Panel A includes trades based variables. 'Number of trades' is the number of trades executed across the two assets (Stocks and P-ETFs). 'Number of purchases' is the number of purchases executed over the sample period. 'Number of sales' is the number of sales executed over the sample period.'Trading volume' is the volume in (€) of trades executed over the sample period.'Buying volume' is the volume in (€) of purchases executed over the sample period. 'Selling volume' is the volume in (€) of sales executed over the sample period. 'Trading experience' is computed as the difference between the last and the first trading dates, expressed in number of months. 'Trade duration' is computed as the average number of days between two consecutive trades. 'Number of different securities traded' is the number of different securities traded during the whole period. 'Number of trading days' is the total number of different trading days during the whole trading period. Panel B includes portfolio based variables. 'Portfolio size' is the average number of securities held in the end-of-month portfolio. 'Value of the portfolio' is the average value of the end-of-month portfolio. 'Turnover' is the average of the absolute values of all the purchases and sales in a particular month divided by the average of the portfolio values at the beginning and the end of this particular month. 'Portfolio holding period' is the number of months between the first month with non-empty portfolio, and the last month with non-empty portfolio, over the sample period (January 2003-March 2012). 'Asset holding period ratio' is asset average holding period in portfolio, expressed as percentage of 'Portfolio holding period'. *,**,*** indicate significance at the level of 10%, 5% or 1%, respectively.

Results in Table 6 clearly indicate that TG investors' trading behavior is linked to the weight of P-ETFs in their aggregate portfolio. We therefore replicate the same univariate t-tests between the CG and each of the TG sub groups (TG1, TG2, TG3 and TG4) in Table 7.

Table 7: Univariate t-test comparisons between sub TG and CG investors for the aggregate portfolio.

Weight of P-ETF in aggregate portfolio		TG1 $0-25\%$ n=242	TG2 $25\%-50\%$ n=112	TG3 $50\%-75\%$ n=70	TG4 $75\%-100\%$ n=88	CG 0% n=511	t-test				
Metrics		Mean (1)	Mean (2)	Mean (3)	Mean (4)	Mean (5)	Diff-1 (1)-(4)	Diff-2 (1)-(5)	Diff-3 (2)-(5)	Diff-4 (3)-(5)	Diff-5 (4)-(5)
Panel A : Trades based variables											
Number of trades		101.95	40.77	37.11	33.05	59.39	68.90***	42.57***	-18.62	-22.27***	-26.34***
Number of purchases		64.85	26.13	23.20	19.69	35.21	45.15***	29.63***	-9.09**	-12.01***	-15.52***
Number of sales		39.91	17.26	15.71	14.51	26.85	25.04***	13.06**	-9.59**	-11.14***	-12.35***
Trading volume	(in €)	4,666.89	3,392.36	7,744.08	5,634,90	6,055.3	-968	-1,388.5*	-2,663***	1,688.7	420.4
Buying volume	(in €)	4,598.70	3,238.43	7,404.02	5,439.97	5,753.9	-841.3	-1,155.2	-2,525.5***	1,650.1	313.9
Selling volume	(in €)	5,129.59	3,651.781	9,204.80	6,413.13	6,968.8	-1,2083.5	-1,839.2***	-3,317***	2,236	-555.6
Trading experience	(in months)	51.30	45.80	46.40	43.43	42.52	7.87***	8.77***	3.28	3.88	0.91
Trade duration	(in days)	39.47	74.21	101.58	105.11	98.08	-65.63***	-58.61***	-23.87**	3.5	7.03
Number of different securities traded		28.60	14.63	10.86	9.72	13.38	-18.88***	15.23***	1.26	-2.52**	-3.65***
Number of trading days		65.11	29.32	27.69	23.66	38.10	41.45***	27.01***	-8.77**	-10.41**	-14.44***
Panel B : Portfolio based variables											
Portfolio size		10.33	5.15	4.12	2.14	4.00	8.18***	6.33***	1.16***	0.12	-1.86***
Portfolio value	(in €)	81,109.85	27,600.41	42,392.35	17,886.93	38,276.5	63,223***	4,2833**	-1,0676	4,116	-2,0390*
Turnover		2.53	0.963	0.299	0.326	1.38	2.21	1.15	-0.42	-1.09*	-1.06*
Portfolio holding period	(in months)	60.03	58.54	61.30	56.51	57.63	3.52	2.40	0.91	3.67	-1.12
Asset holding period ratio (AHPR)		0.668	0.693	0.666	0.550	0.609	0.119***	0.059***	0.084***	0.057*	-0.059*

The table reports the cross-sectional mean and means differences between TG-i groups (aggregate portfolios) and CG (Stocks portfolio). For each variable under scrutiny, we report its mean for each group. Panel A includes trades based variables. 'Number of trades' is the number of trades executed over the sample period. 'Number of purchases' is the number of purchases executed over the sample period. 'Number of sales' is the number of sales executed over the sample period. 'Trading volume' is the volume in (€) of trades executed over the sample period.'Buying volume' is the volume in (€) of purchases executed over the sample period. 'Selling volume' is the volume in (€) of sales executed over the sample period. 'Trading experience' is computed as the difference between the last and the first trading dates, expressed in number of months. 'Trade duration' is computed as the average number of days between two consecutive trades. 'Number of different securities traded' is the number of different securities traded during the whole period. 'Number of trading days' is the total number of different trading days during the whole trading period. Panel B includes portfolio based variables. 'Portfolio size' is the average number of securities held in the end-of-month portfolio. 'Value of the portfolio' is the average value of the end-of-month portfolio. 'Turnover' is the average of the absolute values of all the purchases and sales in a particular month divided by the average of the portfolio values at the beginning and the end of this particular month.'Portfolio holding period' is the number of months between the first month with non-empty portfolio, and the last month with non-empty portfolio, over the sample period (January 2003-March 2012). 'Asset holding period ratio' is asset average holding period in portfolio, expressed as percentage of 'Portfolio holding period'. *,**,*** indicate that the difference is statistically significant at the level of 10%, 5% or 1%, respectively.

In column (Diff-1), we report the t-test statistics for the null hypothesis that the difference in means between the TG1 investors (which invest less than 25% of their aggregate portfolio in P-ETFs) and the TG41 investors (which invest at least 75% of their aggregate portfolio in P-ETFs) is equal to zero. The null is rejected across all variables, except *Turnover* and *Portfolio holding period*, which confirms trading behaviours are heterogeneous among TG investors.

In columns (Diff-2) to (Diff-5), we report the t-test statistics for the equivalent null between the CG and and each of the four TGs respectively. Compared to the CG, *Number of trades*, *Number of different securities traded*, *Number of trading days* is significantly higher for TG1 and lower for TG2, TG3 and TG4. *Trading volume* and *Trade duration* are on average significantly lower in both TG1 and TG2 (relative to CG), while *Trading experience*

is only significantly higher in TG1. There is overall a very sharp contrast between the way the TG1 investors behave relative to the other groups, including the CG.

Panel B confirms the sharp contrast in trading behaviors between the CG and TGs, as well as among them. Relative to the CG, Portfolio size is on average significantly higher in TG1 in TG2, while significantly *lower* in TG4. There is therefore a significantly negative relationship between the **weight** of P-ETFs in the aggregate portfolio of TG investors and the number of securities held in the portfolio. TG1 (TG4) exhibits significantly higher (lower) *Portfolio value* than the CG on average. We also see that TG3 and TG4 investors show a significantly lower *Turnover* mean than the CG. With respect to *Asset holding period ratio*, TG1, TG2 and TG3 show a significantly higher mean than the CG at the 5% level, but it is very interestingly lower for TG4.[11]

3 Multivariate analysis

3.1 P-ETF investors' trading behavior

The previous section provides general insights into the trading behavior of P-ETF investors. In this section, we extend our analysis to a multivariate framework based on cross-sectional regressions, which enables us to test whether retail investors trade P-ETFs differently than stocks *all else equal*, i.e., controlling for all the key individual characteristics discussed in the previous section.

The regressions include the TG dummy equal to 1 if the investor is in the TG, 0 otherwise. Four alternative dummies (TG1, TG2, TG3 and TG4) are based on the weight of P-ETFs in the investor's aggregate portfolio, using a 25% range as in the previous section. The use of the four sub TGs is to capture the *ceteris paribus* differences in trading behavior among TG investors observed in the preceding univariate framework. Our initial model specification is the following:

[11] The multivariate analysis in the next section further documents these findings, showing strong evidence that the TG4 investors manage their portfolio by following a core-satellite strategy.

$$Trading\ Activity\ Measure_i = \beta_0 + \beta_1 * TG_i + \beta_2 * SD_i + \beta_3 * SV_i + \beta_4 * OV_i + \epsilon_i \quad (3)$$

wherein the dependent variable TM_i is a trading measure for investor i used to proxy his or her trading behavior. TM_i is in turn *Portfolio size*, *Log(Turnover)* and *Asset holding period ratio (AHPR)*, as defined in the previous section. The variable of interest is TG_i, which is set to 1 if investor i holds at least one P-ETF in his or her portfolio, 0 otherwise. In alternative specifications, TG_i, is replaced by the four sub TG groups ($TG1$ to $TG4$) as explained above. To control for individual characteristics, we include SD_i as a vector of sociodemographics, which includes age, gender, the level of education and the spoken language of investor i. The second vector, SV_i, includes subjective variables which are based on investor i's answers to the A-test. It includes *Knowledge of financial markets*, *Knowledge of 'complex' instruments*, *Experience with 'complex' instruments*, and *Awareness of the losses of 'complex' instruments*. All these variables are further explained in 3. The third vector, OV_i, corresponds to objective variables and is based on trading records. It includes the *number of trades*, *trading experience*, *trade duration* and the *number of different securities traded* by retail investor i. They are further detailed in 5.

Table 8 reports the results. In Panel A, the regression on $PortfolioSize$ in column (1) brings evidence that the TG investors hold more securities than the CG investors. Regression (2) further suggests that there is meaningful heterogeneity among the TGs since the marginal effect of holding P-ETFs on portfolio size decreases as investors hold a larger proportion of their aggregate portfolio in P-ETFs, going from TG1 to TG4. The lower the weight of P-ETFs in the aggregate portfolio, the more securities investors hold. For example, retail investors whose aggregate portfolios are invested in P-ETFs for at most 25% (at least 75%) hold on average 3.41 (1.12) securities more (less) than the CG investors, all else equal. Therefore, all the TG investors hold more securities than the CG investors, except the P-EFT retail investors who are already very much diversified by investing at least 75% of their aggregate portoflio into P-ETFs. In this case only, they hold a more concentrated portfolio than the CG investors in terms of the number of securities. This shows that the TG investors

are better aware of the need to diversify than the CG investors. Their understanding of diversification is also quite subtle since the TG investors who are the most exposed to P-ETFs ($TG4$), avoid the inefficiency of adding as many assets in their aggregate portfolio as the CG investors.

Table 8: P-ETF investors' trading behaviors.

		Portfolio size		Log(Turnover)		AHPR	
		(1)	(2)	(3)	(4)	(5)	(6)
Panel A : Variable of interest							
TG	Dummy =1 if P-ETF user	1.507***		-0.493***		0.083***	
TG1	Dummy =1 if P-ETF user in TG1		3.412***		-0.547***		0.157***
TG2	Dummy =1 if P-ETF user in TG2		0.762**		-0.531***		0.096***
TG3	Dummy =1 if P-ETF user in TG3		0.618		-0.656***		0.049*
TG4	Dummy =1 if P-ETF user in TG4		-1.120***		-0.198*		-0.071***
Panel B : Socio-demographic variables							
Age	Years	0.055***	0.049***	-0.014***	-0.013***	0.003***	0.002***
Gender	Dummy=1 if male	0.012	0.089	-0.031	-0.038	-0.020	-0.016
Higher education	Dummy=1 if university	0.668**	0.565**	-0.156**	-0.146**	0.074**	0.068***
Dutch-speaking	Dummy=1 if Dutch	0.537**	0.565**	-0.190***	-0.185***	0.048***	0.046***
English-speaking	Dummy=1 if English	0.278	0.453	-0.471***	-0.462***	0.022	0.028
Panel C : Subjective variables							
Knowledge of financial markets	(score 0-3)	-0.131	-0.098	-0.073*	-0.078*	0.012	0.015
Knowledge of 'complex' instruments	(score 0-18)	0.049	0.067	0.003	0.001	0.000	0.002
Experience with 'complex' instruments	(score 0-18)	-0.034	-0.0455	0.015	0.0017	-0.002	-0.004
Awareness of the losses of 'complex' instruments	(score 0-9)	0.007	-0.018	-0.008	-0.005	-0.004	-0.003
Panel D : Objective variables							
Number of trades		-0.010***	-0.009***	0.005***	0.005***	-0.001***	-0.001***
Trading experience	(in months)	-0.012**	-0.009*	-0.004***	-0.004***	-0.002***	-0.002***
Trade duration	(in days)	-0.000	0.000	-0.002***	-0.002***	0.001***	0.001***
Number of different securities traded		0.242***	0.213***	-0.002	-0.001	-0.002***	-0.003***
Intercept		-1.481**	-0.914	-0.384**	-0.414**	0.514***	0.539***
Adjusted R^2		0.507	0.552	0.383	0.388	0.241	0.282
N		1023	1023	1,.023	1,023 1,023	1,023	1,023

Note: this table reports the results of a cross-sectional regressions where the dependent variables are the portfolio size for models (1) and (2), the logarithm of turnover for models (3) and (4) and the Asset holding Period Ratio (AHPR) for models (5) and (6). Panel A includes variables of interest. 'TG' is a dummy variable set to 1 if investor holds a P-ETF and 0 otherwise. 'TG1', 'TG2', 'TG3' and 'TG4' are dummies characterizing the weight of P-ETFs in the aggregate portfolio with four intervals of 25% range spread (i.e.]0%-25%],]25%-50%],]50%-75%] and]75%-100%] respectively). Panel B refers to sociodemographics as control variables. 'Age' is determined as the difference between 2012and the investor's year of birth.'Gender' is a dummy variable equal to one if the investor is a male. 'Higher Education' is a dummy variable set to one for investors with a university degree (or equivalent). 'Dutch-speaking' and 'English-speaking' are both dummies based on the language selected by the investor on the online trading platform. Panel c includes subjective variables (from the A-test). 'Knowledge of financial markets' refers to one specific question where investors have to self-assess their knowledge of financial markets on a scale of four levels,wherein Level 0 is associated with a basic knowledge while Level 3 refers to an experienced investor 'who manages any aspect of the financial markets'. For 'Knowledge of "complex" instruments', 'Experience with "complex" instruments' and 'Awareness of the losses with "complex" instruments', the score elicits the investor's self-assessment regarding his/her own abilities and skills. For example, a score of 18 out of 18 for the Knowledge of "complex" instruments means that the investor considers himself/herself as an expert in the field. Conversely, a score of 0 (out of 18) indicates that the investor declares no knowledge about "complex" instruments. 'Appetite for information' is binary variable with a value of 1 if the investor has asked for an access to the information tool on stocks and has completed the S-test and 0 otherwise. Panel D includes objective variables characterizing trading activity. 'Number of trades' is the number of trades executed over the sample period. 'Trading experience' is computed as the difference between the last and the first trading dates, expressed in number of months.'Trade duration' is computed as the average number of days between two consecutive trades. 'Number of different stocks traded' is the number of different stocks traded. *,**,*** indicate that the coefficient is statistically significant at the level of 10%, 5% or 1%, respectively.

In regressions (3) and (4), we choose *log(Turnover)* as the dependent variable. The marginal effect of the variable of interest TG in regression (3) is significant and negative,

indicating that the turnover of the aggregate portfolio is lower when retail investors hold P-ETFs. The retail investors who hold a P-ETF in their aggregate portfolio have a 49.3% lower turnover than investors who only trade stocks, all else equal. All coefficient estimates are also statistically negative across the TG sub groups.

In regressions (5) and (6), the dependent variable is *Asset holding period ratio* (AHPR). We find that investors who invest in P-ETFs exhibit a higher *Asset holding period ratio* than CG investors, especially TG1 and TG2 investors whose AHPR is 16 and 10 percentage points higher than CG investors respectively. We interestingly estimate a significantly negative marginal effect in the case of TG4 investors, which means that they hold their assets 7% percentage points 'less longer' (in terms of their portfolio holding period) than CG investors.[12]

Regarding covariates and sociodemographics in particular, Panel B in Table 8 indicates that three variables, i.e., *Age*, *Higher education* and *Dutch-speaking*, have all a positive and significant impact on *Portfolio size* and *Asset holding period ratio*. Put in other words, older, better educated, Dutch-speaking retail investors have larger portfolio sizes and are less active since they keep their assets for a longer period of time. Correspondingly to the empirical results found for *Asset holding period ratio*, *Turnover* decreases when investors are older, better educated, either Dutch- or English-speaking.

In Panel C of Table 8, there is no no subjective variable being statistically significant. As discussed in the previous section, this is most probably due to the matching procedure which led to the identification of the CG. *Financial knowledge and experience* were two key drivers of the matching scores, leading the TG and CG samples to display almost identical levels. The matching procedure may have therefore completely (and rightly so) emptied the information content of these two variables.

In Panel D of Table 8, we find that investors hold a higher number of securities in their end-of-month portfolio (*Portfolio size*) when they make less transactions (*Number of trades*) and trade a larger variety of assets (*Number of different securities traded*), which is very much expected. In addition, the more experienced the retail investors, the lower the number of different securities in their end-of-month portfolio, since the coefficient estimate of *Trading experience* is negative (and significant). When *Turnover* is used as the dependent

[12] An explanation is provided in Table 9 and related to the core-satellite approach.

variable, the three significant drivers are *Number of trades*, *Trading experience*, and *Trade duration*. The higher trading experience, the lower the turnover all else equal. As expected, turnover also decreases when the number of trades or the average number of days between two consecutive trades (*Trade duration*) increases. Finally, we find in model specifications (5) and (6) that investors who are more experienced, make more transactions (*Number of trades*), trade a greater diversity of securities (*Number of different securities traded*), or display shorter trade duration, hold their assets for a shorter period of time (*Asset holding period ratio*).

The most intriguing result was found for the TG4 investors, i.e., investors whose aggregate portfolio is at least 75% invested in P-ETFs. All else equal, they hold a significantly lower number of securities in their end-of-month portfolio than do both all the other P-ETF users and non-users, as pointed out in model (2) in Table 8. Their *Asset holding period Ratio* is also significantly lower, as indicated in model (6) in 8 again.[13].

We further investigate the trading behavior of this group of investors in Table 9 by distinguishing P-ETFs and stocks in their aggregate portfolio with respect to the same three variables used as dependent variables in the previous multivariate analysis, i.e., *Portfolio size*, *Turnover* and *Assets Holding Ratio*. We run ANOVA tests for stocks and P-ETFs separately across the four TGs to identify significant differences.

Panel A reveals that portfolio size (in terms of the number of securities held in their end-of month portfolio) is statistically different across TGs even when stocks are separated from P-ETFS. However, the economic difference is extremely meaningful with respect stocks, and not so much with respect to P-ETFs. While TG4 investors hold 24% more P-ETFs than TG1 investors (i.e. 1.422/1.15 - 1), they cut the number of stocks by a much higher margin. TG1 investors hold almost 6 times stock securities than TG4 investors. EVen TG3 investors hold 67% more stocks than TG4 investors. So, investing a significant proportion of the aggregate portfolio (at least 75%) in P-ETFs implies holding the remaining proportion (at most 25%) in a much lower number of stocks (1.7 on average), mimicking a core-satellite approach.

In line with the previous results, Panel B shows that there is no difference among the four groups regarding *Turnover* which is based on monetary values, be it in stocks or in

[13]This interesting result was noted in Panel B of Table 7 in the t-test between TG4 and CG.

Table 9: Univariate ANOVA comparisons among TG investors for stocks and P-ETFS separately.

Weight of P-ETF in aggregate portfolio Number of observations	TG1 $0-25\%$ n=242 Mean	TG2 $25\%-50\%$ n=112 Mean	TG3 $50\%-75\%$ n=70 Mean	TG4 $75\%-100\%$ n=88 Mean	F-stat
Panel A: Portfolio size					
Stocks	9.737	4.429	2.846	1.704	73.08***
	(7.141)	(3.182)	(1.699)	(1.350)	
P-ETFs	1.150	1.297	1.756	1.422	11.03***
	(0.573)	(0.836)	(1.251)	(0.842)	
Panel B: Turnover					
Stocks	2.614	1.017	0.357	0.418	0.30
	(34.623)	(7.722)	(0.888)	(0.610)	
P-ETFs	2.904	0.273	0.283	0.562	0.35
	(40.742)	(0.429)	(0.498)	(0.765)	
Panel C: Asset holding period ratio					
Stocks	0.669	0.696	0.659	0.585	2.92**
	(0.243)	(0.278)	(0.297)	(0.320)	
P-ETFs	0.920	0.960	0.931	0.939	1.51
	(0.196)	(0.115)	(0.154)	(0.129)	

The table reports the results for the analysis of variance (ANOVA) on the relationship between three variables characterizing trading behavior and the weight of P-ETFs in the aggregate portfolio, for the two components separately (Stocks and P-ETFs) . Panel A includes the mean and the standard error (in brackets) for each TG sub group regarding the Portfolio size. Panel B includes the mean and the standard error (in brackets) for each TG sub group regarding the Turnover . Panel C includes the mean and the standard error (in brackets) for each TG sub group regarding the Asset holding period ratio.
*,**,*** indicate significance at the level of 10%, 5% or 1%, respectively.

P-ETFs.

Panel C sheds light on the way the asset holding period ratio differs between stocks and P-ETFS. As pointed out in Tables 6 and 8, the TG4 investors hold their assets 'less longer' (in terms of their portfolio holding period), but this is due to the way they trade stocks, not P-ETFs. In comparison to the other three TGs, the ANOVA test is only significant for stocks. This another indications that the TG4 investors rather opt for a core-satellite strategy whereby they keep 'satellite' stocks, representing at most 25% of their portfolio value, for shorter time periods and trade them more frequently, as indicated in model (4) in Table 8).

To summarize tables 8 and 9, 'holding P-ETFs makes a change'. All else equal, retail investors who hold P-ETFs invested in stocks have higher *Portfolio size*, lower *Turnover*, and higher *Asset holding period ratio* than investors who only hold individual stocks (CG). We therefore validate the null hypothesis that retail investors who hold passive stock ETFs, trade differently than those who only hold individual stocks. Among the P-ETF holders, those who are most invested in them (TG4) distinguish themselves by trading their stocks more dynamically, in line with the recommendation of the core-satellite strategy.

3.2 P-ETFs investors and stock gambling

Trading and gambling share structural characteristics, sadly enough. Stock gambling can even be an addictive process and a serious disorder in some cases (Grall-Bronnec et al., 2017). Although there is strong evidence that holding P-ETFs implies different trading behaviors, we do not know whether it helps protect retail investors against stock gambling.

To investigate this possibility, we identify lottery-type stocks at the monthly frequency among all the stocks traded in our sample.[14] Following Kumar (2009), the stocks that are likely to be perceived as lottery-type stocks, are those in the lowest k^{th} stock price percentile, the highest k^{th} idiosyncratic volatility percentile, and the highest k^{th} idiosyncratic skewness percentile.[15]

[14] A stock may be considered as a lottery-type stock for a specific month and not necessarily over the full sample.

[15] In Kumar (2009), $k = 50$. Volatility and skewness are computed over 6 months of daily returns. We use total volatility and total skewness in our approach since Kumar (2009) finds that the idiosyncratic and total

We then estimate individual preference (*gambling preference*) for lottery-type stocks using two metrics. The first measure of preference for lottery-type stocks, LP^1, for investor i in month t, is the *raw portfolio weight* allocated to lottery-type stocks.

$$LP^1_{i,t} = \frac{\sum_{j \in \zeta_{t-1}} n_{ijt} P_{jt}}{\sum_{j=1}^{N_{it}} n_{njt} P_{jt}} * 100, \tag{4}$$

where ζ_{t-1} is the set of lottery-type stocks defined at the end of month $t-1$, N_{it} is the number of stocks in the portfolio of investor i at the end of month t, n_{njt} the number of shares of stock j in the portfolio of investor i at the end of month t, and P_{jt} is the price of stock j in month t.

The second measure of lottery-type stock preference we use, is LP^2 based on investor i's trades.

$$LP^2_{i,t} = \frac{VBL_{i,t}}{VB_{i,t}} * 100, \tag{5}$$

where $VBL_{i,t}$ is the buy volume for lottery-like stocks for investor i in month t, and $VB_{i,t}$ is total buy volume for all stocks for investor i in month t.

Finally, we estimate four panel data regressions over 111 months (from January 2003 to March 2012) using the sample of 1,023 investors which constituted the TGs and CG in the preceding sections. As dependent variable, we use the two above-defined lottery-type stock preference measures ($LP^1_{i,t}$ and $LP^2_{i,t}$). More specifically,

$$LP_{i,t} = \beta_0 + \beta_1 * TG_{i,t} + \beta_2 * Crisis_t + \beta_3 * SD_i + \beta_4 * SV_i + \beta_5 * OV_i + \epsilon_{i,t} \tag{6}$$

where the dependent variable $LP_{i,t}$ is a lottery-stock preference measure for investor i in month t, $TG_{i,t}$ is a dummy variable set to 1 in every month t if investor i holds a P-ETF, 0 otherwise. A negative and significant β_1 means that holding a passive ETF protects retail investors against holding speculative stocks. $Crisis_t$ is a dummy variable set to 1 for every month t between September 2008 and June 2009, 0 otherwise.

As in equation 3, we control for individual characteristics. We add a vector of sociode-

measures provide equivalent results.

mographics, SD_i, including age, gender, the education level, and the spoken language. The second vector is SV_i, corresponding to subjective variables derived from the retail investors' answers given in the A-test. It includes *Knowledge of financial markets*, *Knowledge of 'complex' instruments*, *Experience with 'complex' instruments*, *Awareness of the losses of 'complex' instruments* and *Appetite for information*. These variables are further detailed in 3. The third vector, OV_i, corresponds to objective variables and is based on trading records. It includes the *number of trades*, *trading experience*, *trade duration* and the *number of different securities traded* by retail investor i. They are further explained in 5.

When estimating this panel data regressions, we also cluster standard errors by month and by investor, i.e., we use double-clustered standard errors which account for two dimensions of within-cluster correlation.[16]

To test whether the magnitude of investing in P-ETFs bears on the magnitude of investing in lottery-like stocks, we also estimate the panel model specification below:

$$\begin{aligned} LP_{i,t} = \beta_0 + \beta_1 * TG1_{i,t} + \beta_2 * TG2_{i,t} + \beta_3 * TG3_{i,t} + \beta_4 * TG4_{i,t} + \beta_5 * Crisis_t \\ + \beta_6 * OV_i + \beta_7 * SDV_i + \beta_8 * SV_i + \epsilon_{i,t} \end{aligned} \tag{7}$$

where we replace the dummy TG by the four dummies TG1 to TG4, as defined before in Section 2.3. They help discriminate among P-ETF retail investors.[17]. We use exactly the same covariates than in equation 6.

Table 10 reports the results for the four panel regressions, where the dependent variables are $LP^1_{i,t}$ for models (1) and (2) and $LP^2_{i,t}$ for models (3) and (4).

[16]The goal of this method is to take into consideration the correlation among different investors in the same month and different months for the same investor. As explained in Thompson (2011) the choice of this approach is based on a trade-off between bias (underestimating the true standard error) and variance. According Thompson (2011) clustering by time eliminates most of the bias if there are far more firms (here, retail investors) than time periods. Exploring the bias issue, Petersen (2009) finds that the bias in the clustered standard error estimates decreases with the number of periods (dropping from 27% when there are only 5 periods to 1% when there are 100 periods). In our case the number of periods (months) is equal to 111, which means that we can take advantage of double-clustered standard errors since it is an easy robustness check and the size of the bias is extremely limited (i.e. the standard error estimates are more accurate).

[17]'TG1', 'TG2', 'TG3' and 'TG4' are dummies characterizing the weight of P-ETFs in the aggregate portfolio with four intervals of 25p% range (i.e.]0%-25%],]25%-50%],]50%-75%] and]75%-100%] respectively)

Table 10: Results of panel regressions

		$LP^1_{i,t}$		$LP^2_{i,t}$	
		(1)	(2)	(3)	(4)
Panel A : Variables of interest					
Hold P-ETF	Dummy =1 if investor hold P-ETF	-0.516***		0.066	
TG-1	Dummy if P-ETF user in TG-1		-2.920***		-0.547***
TG-2	Dummy if P-ETF user in TG-2		-1.361***		-0.003
TG-3	Dummy if P-ETF user in TG-3		-3.663***		-0.300
TG-4	Dummy if P-ETF user in TG-4		-5.867***		-0.785***
Financial crisis 2008	Dummy	2.305***	2.292***	1.476***	1.468***
Panel B : Socio-demographic variables					
Age	In years	-0.038***	-0.047***	-0.006***	-0.008***
Gender	Dummy	0.184	0.139	-0.097	-0.109
Higher education	Dummy	-0.723***	-0.736***	-0.267***	-0.272***
Dutch-speaking	Dummy	0.019	-0.060	0.112	0.098
English-speaking	Dummy	-0.678***	-0.648***	-0.250***	-0.252***
Panel C : Subjective variables					
Knowledge of financial markets	Score 0-3	-0.081	-0.012	-0.067	-0.054
Knowledge of 'complex' instruments	Score 0-18	-0.087***	-0.070***	-0.008	-0.005
Experience with 'complex' instruments	Score 0-18	0.093***	0.063***	0.016	0.011
Awareness of the losses of 'complex' instruments	Score 0-9	0.059***	0.056***	-0.004	-0.004
Appetite for information	Dummy	-0.824***	-0.659***	-0.004	-0.164***
Panel D : Objective variables					
Number of trades		0.386***	0.362***	0.635***	0.630***
Trading experience	(in months)	0.044***	0.045***	0.010***	0.011***
Trade duration	(in days)	-0.002***	-0.003	-0.002***	-0.002***
Number of different securities traded		-0.030***	-0.016***	0.635***	0.011***

Note: this table reports the results of the panel regressions, where the dependent variables are $LP^1_{i,t}$ for models (1) and (2) and $LP^2_{i,t}$ for models (3) and (4). Panel A includes variables of interest. 'TG' is a dummy variable set to 1 if investor holds a P-ETF and 0 otherwise. 'TG1', 'TG2', 'TG3' and 'TG4' are dummies characterizing the weight of P-ETFs in the aggregate portfolio with four intervals of 25% range spread (i.e.]0%-25%],]25%-50%],]50%-75%] and]75%-100%] respectively). 'Financial crisis 2008' is dummy variable set to 1 if the month is between September 2008 and June 2009 and 0 otherwise. Panel B refers to sociodemographics as control variables. 'Age' is determined as the difference between 2012and the investor's year of birth.'Gender' is a dummy variable equal to one if the investor is a male. 'Higher Education' is a dummy variable set to one for investors with a university degree (or equivalent). 'Dutch-speaking' and 'English-speaking' are both dummies based on the language selected by the investor on the online trading platform. Panel c includes subjective variables (from the A-test). 'Knowledge of financial markets' refers to one specific question where investors have to self-assess their knowledge of financial markets on a scale of four levels,wherein Level 0 is associated with a basic knowledge while Level 3 refers to an experienced investor 'who manages any aspect of the financial markets'. For 'Knowledge of "complex" instruments', 'Experience with "complex" instruments' and 'Awareness of the losses with "complex" instruments', the score elicits the investor's self-assessment regarding his/her own abilities and skills. For example, a score of 18 out of 18 for the Knowledge of "complex" instruments means that the investor considers himself/herself as an expert in the field. Conversely, a score of 0 (out of 18) indicates that the investor declares no knowledge about "complex" instruments. 'Appetite for information' is binary variable with a value of 1 if the investor has asked for an access to the information tool on stocks and has completed the S-test and 0 otherwise. Panel D includes objective variables characterizing trading activity. 'Number of trades' is the number of trades executed over the sample period. 'Trading experience' is computed as the difference between the last and the first trading dates, expressed in number of months.'Trade duration' is computed as the average number of days between two consecutive trades. 'Number of different stocks traded' is the number of different stocks traded. *,**,*** indicate that the coefficient is statistically significant at the level of 10%, 5% or 1%, respectively.

We first examine in Panel A the coefficient estimates of the variables of interest, i.e., the TG and the four TGi dummies. There is very strong evidence that holding passive ETFs in portfolio is negatively related to investor's propensity to invest in lottery-type stocks when it is proxied by the first measure of lottery-stock preference (LP^1). For all the P-ETF-holding

dummies in models (1) and (2), we find a negative and statistically significant marginal impact at the 1% level. We therefore validate our null hypothesis, i.e., holding an P-ETFs on equities reduces the gambling behavior of retail investors as regards stocks trading.

Among holders of P-ETFs, the retail investors who are least likely to hold lottery-like stocks are those who invested the most in P-ETFs, as shown by the the coefficient estimate of the TG4 dummy (-5.867). Based on previous findings, we can conclude that these investors tend to follow a core-satellite approach, trade their satellite stocks more dynamically, but do *not* select them among gambling stocks.

The use of the second measure of lottery-stock preference (LP^2) is less revealing, but evidence still points in the same direction when statistical significance shows up. The same conclusion is also reached withe respect to the TG4 investors since the most negative and significant coefficient estimate (-0.785) is found for the TG4 dummy. The retail investors who are best protected against stock gambling are again those who invest the most in P-ETFs,

An interesting piece of evidence emerges with respect to the dummy *Crisis*. Investors increased their propensity to invest in lottery-like stock during the financial crisis of 2008-2009. This result is in line with Hoffmann et al. (2013), as they find that retail investors continued to trade and did not 'de-risk' their investment portfolios during the crisis by moving into cash positions in order to reduce their risk. In contrary, retail investors use the depressed asset prices to bet more on lottery-like stocks.

In Panel B, three sociodemographic variables (*Age*, *Higher education* and *English-speaking*) have negative impact on the propensity of investors to invest in lottery-like stocks. Older, better educated and English-speaking investors gamble less with their stocks.

Panel C confirms that our model specification makes economic sense. *Knowledge of 'complex' instruments* and *Appetite for information* display significant and negative coefficient signs. Retail investors with higher knowledge of 'complex' instruments and appetite for information exhibit a lower propensity to invest in lottery-type stocks. This outcome is consistent with Bellofatto et al. (2019) who show that investors who display an appetite for information tend to make smarter investment decisions than their counterparts. In contrast, variables *Experience with 'complex' instrument* and *Awareness of the losses of 'complex' instruments* indicate a positive marginal effects on the propensity to invest in lottery-type

stocks, which also makes sense since these two variables go beyond the simple knowledge of complex instruments and capture the level of experience retail investors declare to have with complexity and non-linear risk.

Regarding the objective variables in Panel D, two variables seems to impact positively the investors propensity to trade lottery-type stocks, i.e., *Number of trades* and *Trading experience*. The more trades retail investors actually make (or the more active they are in trading), the more likely they invest in lottery-type stocks (all else equal). Also, the longer their experience in trading (meaning they have survived for a longer period of time), the more likely they invest in lottery-type stocks (all else equal). As expected, the ceteris paribus effect of *Trade duration*, which is a proxy for trading 'inactivity', is statistically negative, meaning that a higher average number of days between two consecutive trades lowers the chance of holding a lottery-type stock. Finally, *Number of different securities traded* also exhibits a negative and significant coefficient estimate, suggesting that retail investors who gamble more with their stocks do it in a more concentrated portfolio, again a logical conclusion.

4 Conclusion

Bhattacharya et al. (2017) show that retail investors trade ETFs poorly, mainly because they choose bad ETFs and trade them at bad times. We do not question these broad study which mixes all types of ETFs, from the most standard to the most exotic ETFs. We instead complement it by focusing on the retail investors who potentially follow the traditional portfolio management 'wisdom' of following a simple passive investment strategy. Retail investors can easily apply this strategy by holding passive ETFs invested in stocks (P-ETFs).

We use a sample of 14,134 Belgian investors over the January 2003-March 2012 period, with two types of data: trading records and surveys. Using propensity score probabilities estimated in a logistic regression model, we match our treated group of P-ETF retail investors to a control group of investors who only hold stocks, leading to two similar groups of similar size. Controlling for all the key investor characteristics (including sociodemographics, financial knowledge, financial experience, level of education or portfolio value), we reach the

following conclusions.

First, retail investors who hold P-ETFs trade differently in comparison to the control group. Put in other words, 'holding P-ETFs makes a change' since retail investors who hold P-ETFs have a higher portfolio size, a lower turnover, and keep their assets for a longer period of time than the control group of retail investors who hold individual stocks only.

Second, we cluster P-ETF retail investors in four groups according to the weight of P-ETFs in their aggregate portfolio and show that retail investors who hold P-ETFs do not behave in a homogeneous manner. Those who are most invested in P-ETFs, i.e., holding more than 75% of their aggregate portfolio in P-ETFs, have a lower number of securities in the portfolio and keep their stocks for a shorter time periods, pointing to a core-satellite investment approach.

Third, holding P-ETFs helps protect retail investors against stock gambling. We identify lottery-type stocks at the monthly frequency among all the stocks traded in our sample by using two lottery-type stock preference measures. Controlling for all the key individual characteristics again, we find string evidence that retail investors who invest in P-ETFs have a lower propensity to gamble by investing in lottery-type stocks. Among holders of P-ETFs, the retail investors who are least likely to hold lottery-like stocks are those who invested the most in P-ETFs. These investors trade their satellite stocks more dynamically but are not biased toward selecting gambling stocks.

There is overall little doubt that holding passive ETFs changes retail investors' trading behavior for the better.

5 Appendix

Table 11: Results of the logit model for the propensity score matching

ETF	Estimates	P-value
Intercept	-3.80	< 0.00
English- speaking	0.71	< 0.00
Higher education	0.27	0.01
Financial knowledge	0.28	< 0.00
Financial experience	-0.02	0.07
portfolio value	0.00	0.022
Pseudo R^2	0.018	
N	14,134	

This table reports the parameter estimates for a logit model wherein the dependent variable, Y_i, is a binary variable that equals 1 if investor i traded at least once P-ETFs during the sample period and 0 otherwise.'English speaking' is a dummy=1 if the investor speaks English, 'Higher of education' is a dummy=1 if the investor holds a university degree or equivalent, 'Financial knowledge', 'Financial experience' and 'portfolio value' is the monthly average end-of-month portfolio market value in €.

Table 12: ANOVA results - trading activity measures (aggregate portfolio).

Weight of P-ETF in aggregate portfolio Number of observations	TG-1 $< Q_1 = 0.1291$ n=128 Mean	TG-2 $> Q_1 = 0.1291$ & $< Q_2 = 0.2746$ n=128 Mean	TG-3 $> Q_2 = 0.2746$ & $< Q_3 = 0.5883$ n=128 Mean	TG-4 $> Q_3 = 0.5883$ n=128 Mean	F-stat
Panel A : Trades based variables					
Number of trades	136.84	61.96	38.38	34.27	18.7***
Number of purchases	85.99	40.26	24.63	20.82	23.97***
Number of sales	54.69	23.74	15.71	14.98	11.41***
Trading volume	4,770.98	4,347.39	3,878.18	6,904.8	3.38**
Buying volume	4,844.06	4,135.07	3,684.38	6,653.60	3.07**
Selling volume	4,978.62	5,120.11	4,403.96	7,882.48	3.10**
Trading experience	53.80	48.83	44.63	45.04	3.88***
Trade duration	31.12	50.65	80.69	104.93	23.66***
Number of different securities traded	35.39	21.20	12.83	10.09	54.78***
Number of trading days	83.34	43.64	28.50	27.67	28.91***
Panel B : Portfolio based variables					
Portfolio size	12.87	7.44	4.70	2.76	97.08***
Value of the portfolio	114,580.38	40,927.39	27,029.29	30,442.19	4.58***
Turnover	4.57	0.24	0.88	0.33	0.99
Portfolio holding period	62.32	58.13	57.71	58.95	0.94
Asset holding period ratio (HPR)	0.664	0.679	0.678	0.591	3.21**

The table reports the results
*,**,*** indicate that the difference is statistically significant at the level of 10%, 5% or 1%, respectively.

Table 13: Trading activity measures: sub TGs vs CG (aggregate portfolio).

		TG-1 n=128	TG-2 n=128	TG-3 n=128	TG-4 n=128	CG n=511	t-test				
Metrics		Mean (1)	Mean (2)	Mean (3)	Mean (4)	Mean (5)	Diff-1 (1)-(4)	Diff-2 (1)-(5)	Diff-3 (2)-(5)	Diff-4 (3)-(5)	Diff-5 (4)-(5)
Panel A : Trades based variables											
Number of trades		136.84	61.96	38.38	34.27	59.39	102.6***	77.45***	2.58	-21.01***	-25.11***
Number of purchases		85.99	40.26	24.63	20.82	35.21	65.18***	50.78***	5.04	-10.59***	-14.40***
Number of sales		54.69	23.74	15.71	14.98	26.85	39.71***	27.84***	-3.11	-11.14***	-11.87***
Trading volume	(in €)	4,770.98	4,347.39	3,878.18	6,904.8	6,055.3	-2,133*	-1,284.4	-1,708.0*	-2,177.2***	848.7
Buying volume	(in €)	4,844.06	4,135.07	3,684.38	6,653.60	5,753.9	-1,809.5	-909.8	-1,618.8*	-2,069.5***	899.7
Selling volume	(in €)	4,978.62	5,120.11	4,403.96	7,882.48	6,968.8	-2,903.9**	-1,990.1**	-1,848.6*	-2,564.8**	913.7
Trading experience	(in months)	53.80	48.83	44.63	45.04	42.52	8.77***	11.28***	6.30**	2.11	2.51
Trade duration	(in days)	31.12	50.65	80.69	104.93	98.08	-73.81***	-66.96***	-47.43***	-17.39	6.85
Number of different securities traded		35.39	21.20	12.83	10.09	13.38	25.30***	22.01***	7.82***	-0.55	-3.28***
Number of trading days		83.34	43.64	28.50	24.67	38.10	58.67***	45.25***	5.54	-9.60**	-13.42***
Panel B : Portfolio based variables											
Portfolio size		12.87	7.44	4.70	2.76	4.00	10.11***	8.87***	3.44***	0.70*	-1.24***
Value of the portfolio	(in €)	114,580.38	40,927.39	27,029.29	30,442.19	38,276.5	84,138.2**	76,303.9*	2,650.9	-11,247.2	-7,834.3
Turnover		4.57	0.24	0.88	0.33	1.38	4.24	3.18	-1.14**	-0.50	-1.05*
Portfolio holding period	(in months)	62.32	58.13	57.71	58.95	57.63	3.36	4.68*	0.49	0.08	1.32
Asset holding period ratio (HPR)		0.66	0.68	0.68	0.59	0.61	0.07**	0.05**	0.07***	0.07***	-0.02

The table reports the results
*,**,*** indicate that the difference is statistically significant at the level of 10%, 5% or 1%, respectively.

Table 14: Results for trading activity measures: Number of securities,Turnover and Holding period ratio (HPR)

		Number different securities traded		Portfolio size		Log(Turnover)		HPR	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A : Variable of interest									
TG	Dummy =1 if P-ETF user			1.122***		-0.376***		0.048**	
TG-1	Dummy =1 if P-ETF use in TG-1				4.070***		-0.352***		0.131***
TG-2	Dummy =1 if P-ETF use in TG-2				1.593***		-0.549***		0.101***
TG-3	Dummy =1 if P-ETF use in TG-3				0.060		-0.373***		0.036
TG-4	Dummy =1 if P-ETF use in TG-4				-1.170**		-0.212*		-0.082**
Panel B : Socio-demographic variables									
Age	(in years)			0.051***	0.047***	-0.014***	-0.014***	0.002***	0.002***
Gender	Dummy			-0.244	-0.055	-0.178	-0.177	-0.013	-0.007
Higher education	Dummy			0.573	0.395	-0.107	-0.106	0.049*	0.041*
Dutch language	Dummy			0.460	0.463	-0.248***	-0.267***	0.042*	0.045**
English languauge	Dummy			-0.011	0.401	-0.525***	-0.568***	0.009	0.032
Panel C : Subjective variables									
Financial markets & products knowledge	(Score 0-7)			-0.139	-0.056	-0.037	-0.034	0.000	0.002
Expected yield on investments	(Score 1-5)			-0.011	-0.086	-0.003	-0.007	-0.012	-0.013
Downside risk aversion	(Score 1-5)			0.093	0.007	0.055	0.503	0.002	0.002
Investments time horizon	(Score 2-11)			0.235***	0.232***	-0.060***	-0.064***	0.015***	0.016***
Wealth and financial situation	(Score 0-17)			0.197***	0.157***	-0.004	-0.004	0.007**	0.006**
Panel D : Objective variables									
Number of trades				-0.019***	-0.017***	0.006***	0.006***	-0.001***	-0.000***
Trading experience	(in months)			-0.011	-0.011	-0.001	-0.001	-0.003***	-0.003***
Trade duration	(in days)			-0.003	-0.002	-0.005***	-0.005***	0.001***	0.001***
Number of different securities traded				0.257***	0.219***	-0.014***	-0.013***	-0.000	-0.001
Intercept				-3.237**	-2.202*	0.292	0.362	0.392***	0.402***
Adjusted R^2				0.545	0.593	0.450	0.452	0.295	0.333
N				1,.023	1,023	1,023	1,023	1,023	1,023

Note: this table reports the results of
*,**,*** indicate that the coefficient is statistically significant at the level of 10%, 5% or 1%, respectively.

References

Anadu, K., M. S. Kruttli, P. E. McCabe, E. Osambela, and C. Shin (2020). The Shift From Active to Passive Investing: Potential Risks to Financial Stability? *Available at SSRN 3244467*.

Barber, B. M., Y.-T. Lee, Y.-J. Liu, and T. Odean (2008). Just How Much Do Individual Investors Lose by Trading? *The Review of Financial Studies 22*(2), 609–632.

Barber, B. M. and T. Odean (2000). Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors. *The Journal of Finance 55*(2), 773–806.

Barber, B. M. and T. Odean (2013). The Behavior of Individual Investors. In *Handbook of the Economics of Finance*, Volume 2, pp. 1533–1570. Elsevier.

Bellofatto, A., M.-H. Broihanne, and C. D'Hondt (2019). Appetite for Information and Trading Behavior. *http://hdl.handle.net/2078.1/211506*, 34.

Bhattacharya, U., B. Loos, S. Meyer, and A. Hackethal (2017). Abusing ETFs. *Review of Finance 21*(3), 1217–1250.

Boone, N. M. and L. S. Lubitz (2004). *Creating an Investment Policy Statement: Guidelines & Templates*. AdvisorPress.

Campbell, J. Y. (2006). Household Finance. *The Journal of Finance 61*(4), 1553–1604.

Cheng, S., M. Massa, and H. Zhang (2018). The Unexpected Activeness of Passive Investors: A Worldwide Analysis of ETFs. *The Review of Asset Pricing Studies 9*(2), 296–355.

Da Dalt, C., D. Feldman, G. Garvey, and P. J. Westerholm (2019). Contrarians or Momentum Chasers? Individual Investors' Behavior When Trading Exchange-Traded Funds. *Journal of Futures Markets 39*(5), 553–578.

De Bondt, W. F. and R. Thaler (1985). Does the Stock Market Overreact? *The Journal of Finance 40*(3), 793–805.

D'Hondt, C., Y. Elhichou Elmaya, and M. Petitjean (2020). Retail Investing in Passive Exchange Traded Funds. *Available at SSRN 3522963*.

D'Hondt, C., R. McGowan, and P. Roger (2020). Trading leveraged Exchange-Traded Products is hazardous to your weath. *Working Paper*.

Easley, D., D. Michayluk, M. O'Hara, and T. J. Putniņš (2018). The Active World of Passive Investing. *Available at SSRN 3220842*.

Enete, S., M. Reiter, W. Usrey, A. Scott, and M. Seay (2018). Characteristics of ETF Owners: Exploring the Role of Investor Knowledge, Fee Aversion, and Financial Advice Seeking. In *2019 Academic Research Colloquium for Financial Planning and Related Disciplines*.

Grall-Bronnec, M., A. Sauvaget, C. Boutin, S. Bulteau, S. Jiménez-Murcia, F. Fernández-Aranda, G. Challet-Bouju, and J. Caillon (2017). Excessive trading, a gambling disorder in its own right? a case study on a french disordered gamblers cohort. *Addictive Behaviors 64*, 340–348.

Guiso, L. and P. Sodini (2013). Household Finance: An Emerging Field. In *Handbook of the Economics of Finance*, Volume 2, pp. 1397–1532. Elsevier.

Hoffmann, A. O., T. Post, and J. M. Pennings (2013). Individual Investor Perceptions and Behavior During the Financial Crisis. *Journal of Banking & Finance 37*(1), 60–74.

Kumar, A. (2009). Who Gambles in the Stock Market? *The Journal of Finance 64*(4), 1889–1933.

Müller, S. and M. Weber (2010). Financial Literacy and Mutual Fund Investments: Who Buys Actively Managed Funds? *Schmalenbach Business Review 62*(2), 126–153.

Oehler, A. and H. P. Wanger (2020). Household Portfolio Optimization With XTFs? An Empirical Study Using the SHS-Base. *Research in International Business and Finance 51*, 101103.

Petersen, M. A. (2009). Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *The Review of Financial Studies 22*(1), 435–480.

Poterba, J. M. and J. B. Shoven (2002). Exchange-Traded Funds: A New Investment Option for Taxable Investors. *American Economic Review 92*(2), 422–427.

Stuart, E. A. (2010). Matching Methods for Causal Inference: A Review and a Look Forward. *Statist. Sci 25*(1), 1–21.

Sushko, V. and G. Turner (2018). The Implications of Passive Investing for Securities Markets. *BIS Quarterly Review, March*.

Thompson, S. B. (2011). Simple Formulas for Standard Errors that Cluster by Both Firm and Time. *Journal of Financial Economics 99*(1), 1–10.