Dominated ETFs*

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ABSTRACT

Within the growing market for exchange-traded funds (ETFs), we identify many dominated ETFs with returns that are highly correlated with those of cheaper, more liquid competitors. Both retail and institutional investors overallocate to dominated funds with non-index strategies. We estimate the aggregate excess fees paid by investors to dominated U.S. equity ETFs to be $4.7 billion from 2000 to 2018. This cost is growing over time as newly listed ETFs claim unique strategies despite high correlations with cheap, well-established index ETFs. Dominated ETFs survive and thrive even without advisor incentive misalignments, suggesting limitations on the potential benefits of expanding fiduciary standards.

Keywords: Exchange Traded Funds (ETFs), Dominated Products, Incentive Alignment
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1 Introduction

Financial markets are riddled with dominated products. These products attract substantial market share despite the existence of nearly identical, cheaper products. Blame for the billions of dollars in losses to investors and customers is cast on agency problems driven by broker and advisor conflicts of interest. Recent academic studies highlight the adverse effects of broker incentives in the markets for mutual funds (e.g., Bergstresser, Chalmers, & Tufano, 2009), bonds (e.g., Egan, 2019), and mortgage loans (e.g., Allen, Clark, & Houde, 2014), among others. From an empirical perspective, the message seems clear that advisor incentive fees are harmful to households. From a theoretical perspective, Roussanov, Ruan, and Wei (2021) suggest that eliminating the mutual fund fees that directly incentivize financial advisors would reduce equilibrium fees, shift capital away from dominated funds, and improve investor welfare. Given this context, one may hypothesize that investor allocations would be efficient in the absence of agency problems. Attempting to achieve this ideal outcome, lawmakers and regulators focus on advisor incentives and financial transparency.[1] Empirical evidence on investor outcomes in a market free from incentive misalignments can serve as a bellwether for the potential efficacy of regulations that target conflicts of interest.

In this paper, we examine dominated products in the market for exchange-traded funds (ETFs). ETFs have no incentive fees, so brokers and advisors have no conflicts of interest.[2] The ETF market, thus, provides an ideal setting for studying the efficiency of investor allocations in the absence of agency problems. ETF investors also face a uniform choice set, which is important for ensuring that we properly identify misallocations. In contrast, the literature studying open-end

[1] Advisor incentives have been addressed by legislation that covers specific situations, such as the fiduciary duties bestowed on employers and service providers for retirement plans by the Employee Retirement Income Security Act of 1974 (ERISA). In 2015, the Department of Labor proposed new, hotly debated fiduciary rules to greatly expand the coverage of fiduciary duties to include financial advisors, brokers, and others who provide financial advice. The Fifth Circuit Court of Appeals vacated these new rules in 2018, ruling in favor of the co-plaintiffs: U.S. Chamber of Commerce, Financial Services Institute, Financial Services Roundtable, Insured Retirement Institute, and Securities Industry and Financial Markets Association. A multitude of laws and regulations are aimed at promoting financial market transparency, including the Investment Company Act of 1940 and the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010.

[2] State Street's Select Sector SPDR series of ETFs charges 12b-1 fees, making it the exception in the ETF market. State Street uses the fees for marketing expenses but does not provide incentives to financial advisors. According to Dan Dolan, director of management strategies at Select Sector SPDRs, "There are no broker dealers. And no one is getting paid," (`https://www.bloomberg.com/news/articles/2017-02-08/where-do-spdr-fees-go-check-the-ice-at-madison-square-garden`).

mutual funds (e.g., Elton, Gruber, & Busse, 2004; Hortaçsu & Syverson, 2004; Boldin & Cici, 2010) often compares funds to alternatives that are outside of most investors' choice sets because few have access to the most favorable share classes.[3] With no conflicts of interest and uniform access to funds, ETF investors are set up for success. If agency problems are to blame for investors' allocations to dominated products, then dominated ETFs should struggle to survive. Rather, we find they thrive. Further, misallocations to dominated ETFs are just as prevalent in accounts managed by financial professionals. These results cast doubt on the purported silver bullet of resolving conflicts of interest.

We study U.S. equity ETFs from January 2000 to June 2018. We identify dominated ETFs among the set of funds with returns that are highly correlated with the returns of competing ETFs. Return correlations are calculated using daily returns over the trailing 12 months, and we use a 95% correlation threshold. Intra-day liquidity is an important feature of the ETF market structure. Khomyn, Putniņš, and Zoican (2024) study ETF competition and discover a tradeoff between fees and liquidity when investors have heterogeneous demand for liquidity. We classify an ETF as dominated only if it charges higher fees and offers lower liquidity compared with a highly correlated competitor. Thus, we identify a set of ETFs that lag behind in both fees and liquidity.

Despite the desirable features of the ETF market, we find that a large number of dominated ETFs collectively manage substantial assets. On average during the sample period, 36% of ETFs in a given quarter are classified as dominated by a competing fund. Dominated ETFs constitute, on average, 34% of the total market capitalization across all U.S. equity ETFs. Nearly half (46%) of total ETF fees in our sample were garnered by dominated ETFs, and investors could have reduced these expenses by over three-fifths (61%) by switching to the corresponding dominant funds. In aggregate, our estimate of the excess fees of dominated ETFs is $4.7 billion during the sample period. Excess costs have steadily increased over time, and we estimate the annual excess fees as of the end of our sample to be $792 million.[4] These excess fees are concentrated among particularly

[3]Access to the share class with the lowest expense ratio often requires a large minimum investment, such as the $5 billion minimum for the Vanguard Total Stock Market Index Fund Institutional Select Shares (VSTSX).

[4]We note that, given our focus on U.S. equity ETFs, these economic costs provide a lower bound for the overall ETF market that includes fixed income, international, commodity, currency, leveraged, and other ETFs.

egregious funds that charge exorbitant fees and are dominated almost immediately upon inception.

Our aggregate-level results show that investors are making large allocations to dominated ETFs, nearly $1 trillion by sample end. Our ETF-level analysis studies where these allocations reside. We hypothesize that investors will invest less in a dominated ETF than they otherwise would due to the existence of a dominant alternative. To test this hypothesis, we use panel regressions to study both fund size and fund flows. We emphasize fund size because excess fees, which investors could avoid by selling a dominated fund and investing in its dominant competitor, are proportional to assets under management.

To study ETF allocations, we classify funds into six mutually exclusive categories: (i) Index ETFs that track well-known indexes; (ii) Sector Index ETFs that track one of 11 broad sector indexes; (iii) Quasi-Index ETFs that follow straightforward rule-based strategies (e.g., equal-weighted S&P 500); (iv) Active ETFs that have actively managed portfolios or use proprietary strategies; (v) Sector Active ETFs that have more unique sector strategies; and (vi) Smart Beta ETFs that pursue exposures to factors such as value, momentum, and low volatility. Within each category, our fund size regressions relate the log of ETF market capitalization to fund characteristics that proxy for fees, liquidity, performance, uniqueness, and investor awareness of the ETF. In each specification, we include an indicator variable for whether a given ETF is dominated, which allows us to study the size of dominated funds after controlling for fund characteristics.

We hypothesize that investors will avoid a dominated ETF because a dominant fund exists. This hypothesis predicts a negative association between ETF size and the dominated ETF indicator variable. The regression results reveal a dichotomy across fund categories. We find support for our hypothesis in the Index and Sector Index categories. Dominated Index ETFs are about 26% smaller (t-statistic of -3.50) than expected given their fund characteristics, and dominated Sector Index ETFs are about 13% smaller (t-statistic of -2.01). In contrast, dominated ETFs in other categories are actually significantly larger than expected. Quasi-Index ETFs are 67% larger (t-statistic of 5.37) and Sector Active ETFs are 33% larger (t-statistic of 4.71). The coefficients are even larger for Active and Smart Beta ETFs, with implied excess sizes of 231% (t-statistic of 9.53) and 125% (t-statistic of 10.67), respectively.

These findings are consistent with recent theories of economic choice with bottom-up attention and salience (e.g., Bordalo, Gennaioli, & Shleifer, 2013, 2020, 2022). Investor attention is drawn to prominent fund features, and investors overweight these salient attributes and underweight nonsalient ones. Index funds have little strategy differentiation, and low index fund fees are salient for investors and the media (Box, Davis, & Fuller, 2020). Stimulus salience and investment goals are aligned in the index ETF market, and investors successfully allocate less to dominated index funds.

Unique names and strategy descriptions of non-index funds are prominently featured. Figure 1 demonstrates that dominated funds feature these more distinctive names. Panel A (Panel B) shows a word cloud for fund names of ETFs that are dominated (dominant) in at least half of quarters they appear in our sample. Words like "Index," "Value," and "Growth" are prominent in both panels as many dominated and dominant funds compete on similar strategies. Beyond the most frequent words, the dominant funds primarily use formal, descriptive words that refer to a specific index or index provider. The dominated funds use a much wider variety of words. Some indicate activeness, such as "Dynamic," "Sentiment," and "Timeliness," and others are blatant attempts to draw attention, such as "Aristocrats," "Breakthroughs," and "Vipers."

[Figure 1 here]

When distracted by unique names, high fees and high correlations with broad indexes may be less salient for the non-index funds. The payment of fees is not directly observable (i.e., fees are deducted from the net asset value), which likely contributes to a lack of fee salience (e.g., Chetty, Looney, & Kroft, 2009; Finkelstein, 2009; deHaan, Song, Xie, & Zhu, 2021; Kim & Yang, 2023). Consistent with fees being nonsalient for non-index funds, Figure 2 shows that ETF fee reductions over time have mostly been isolated to Index and Sector Index funds. ETFs with strategy salience apparently compete less on fees, in line with Bordalo, Gennaioli, and Shleifer (2016). High return correlation from closet indexing is also not a prominent fund attribute. Investors seem to underweight these nonsalient attributes that affect performance and overweight salient strategy descriptions, leading to large allocations to dominated ETFs that advertise, yet fail to deliver, unique strategies.

[Figure 2 here]

Our results suggest investors make large misallocations to strategy-salient ETFs. Delving deeper, dominated ETF allocations may differ between retail accounts and accounts that are managed by financial advisors or other investment professionals. Given that prior studies on dominated products attribute their prevalence to broker and advisor incentives, it seems reasonable to expect that these managed accounts will avoid dominated ETFs because the ETF market has no incentive fees. We show, however, that allocations to dominated funds are very similar in retail accounts and managed accounts. Our finding of errors by unconflicted financial professionals contrasts with a view in the literature that institutional investors can better overcome decision-making hurdles to make superior investments (e.g., Hortaçsu & Syverson, 2004). It is consistent with Linnainmaa, Melzer, and Previtero (2021), who show that financial advisors are prone to make the same mistakes in their personal accounts as in their clients' accounts. Our results on institutional investor allocations to dominated products in a market with no incentive fees imply practical limitations on the potential benefits of eliminating advisor conflicts of interest.

We further demonstrate that our results for dominated ETFs are not driven by funds that are barely dominated on fees or that hold a special competitive position in the ETF market, such as a first mover advantage. Within the strategy-salient categories, we estimate large excess sizes for dominated ETFs with expense ratios that exceed four times those of their cheapest dominant funds. Both early and late movers manage excess assets. Funds that are immediately and persistently dominated also garner excess assets. Most dominated ETFs are dominated by cheap, well-established dominant ETFs rather than by market newcomers.

The rise of the ETF market has provided investors with access to a set of index ETFs that offer cheap diversification and high intra-day liquidity. Despite having ready access to these good investment options, we find ETF investors are overpaying because of their investment choices. Our results are consistent with other studies showing drawbacks of the proliferation of ETFs. Bhattacharya, Loos, Meyer, and Hackethal (2017) show that German ETF investors display poor timing and selection ability in the broad spectrum of ETF listings relative to choosing low-fee, well-diversified ETFs. Box, Davis, and Fuller (2019) document that existing ETFs experience a decline in liquidity when a new related ETF lists and that an increase in listed ETFs does not

create downward pressure on expense ratios. Akey, Robertson, and Simutin (2021) find that ETFs are more active than advertised and this activeness is associated with underperformance, and Ben-David, Franzoni, Kim, and Moussawi (2023) show that specialized ETFs, particularly newly listed ones, earn negative risk-adjusted returns. Increasing costs are also consistent with Hortaçsu and Syverson's (2004) prediction of welfare losses from higher search costs as more funds become available. Investors would benefit from focusing on a small set of cheap, liquid index ETFs.

Our paper complements a recent study by Khomyn et al. (2024). They develop theoretical predictions and provide empirical evidence that some highly liquid index ETFs cater to high-turnover traders, who are liquidity conscious and less sensitive to fees. Because of this competitive equilibrium, we require funds to be dominated in both the fee and liquidity dimensions. Thus, Khomyn et al. (2024) study the welfare costs of high-fee, high-liquidity funds, and we consider the costs of a non-overlapping set of high-fee, low-liquidity funds. These two sets of high-fee funds combine to charge more than 80% of the total ETF fees in our sample (36% for their high-fee, high-liquidity ETFs and 46% for our dominated ETFs). Our studies collaborate to demonstrate that high-fee ETFs exhibit diverse mechanisms to survive and thrive.

Our focus on dominated products in the ETF market is related to a literature that studies mutual funds.[5] Elton et al. (2004) and Hortaçsu and Syverson (2004) demonstrate considerable variation in expense ratios across S&P 500 index funds despite their nearly identical portfolios. In our setting, investors are able to choose any ETF, such that allocations to inferior funds do not result from a lack of access to mutual fund share classes or limited flexibility within workplace retirement account menus. Free of these frictions, we find that investors are actually diverting their investments away from dominated Index ETFs. Boldin and Cici (2010) attribute most of the losses from higher-fee index funds to retail investors who are influenced by brokers and financial advisors with incentives to guide investors into high-fee funds. Our focus on ETFs, which have no broker incentives, allows us to rule out this explanation for dominated ETFs. Cooper, Halling,

[5]In addition to the mutual fund literature, prior literature documents dominated products in the markets for money market funds (Christofferson & Musto, 2002), bonds (Green, Hollifield, & Schürhoff, 2007; Egan, 2019), insurance (Brown & Goolsbee, 2002; Bhargava, Loewenstein, & Sydnor, 2017), and mortgages (Allen, Clark, & Houde, 2014, 2019; Gurun, Matvos, & Seru, 2016). Our study also relates to the broader literature on household finance (see, e.g., Campbell, 2006), although we find similar allocations to dominated ETFs by institutional and retail investors.

and Yang (2021) find that fee dispersion has persisted both in index funds and in other types of mutual funds, and they estimate large costs to investing in high-fee funds. We contribute to the literature by demonstrating economically large, growing costs in the ETF market, and we provide evidence that dominated funds are pervasive within the set of newcomers capitalizing on recent trends toward more complex investment strategies.

2 Data

Section 2.1 describes our data sources for ETF characteristics. Section 2.2 discusses the measures we create to examine the performance and uniqueness of ETFs. Section 2.3 presents information about our sample and summary statistics.

2.1 Data Sources

We focus on the universe of U.S. equity ETFs.[6] We identify ETFs as U.S. equity using Lipper codes from the Center for Research in Security Prices (CRSP), and we remove leveraged ETFs by dropping any fund with a leverage factor from Bloomberg that does not equal one. Our sample period is January 2000 to June 2018, and we measure ETF characteristics quarterly to form the panel dataset.

Our ETF characteristic data are from Bloomberg and CRSP. We collect daily ETF share prices, net asset values (NAVs), shares outstanding, and trading volumes from both Bloomberg and CRSP. We follow Brown, Davies, and Ringgenberg (2021) and use Bloomberg as the primary data source, and we clean these data by removing anomalies that are not verifiable via CRSP. We collect inception dates from Bloomberg. From CRSP, we use fund sponsors, expense ratios, internal turnover ratios, and bid-ask spreads.

We calculate the total quarterly holdings in institutionally managed accounts for each ETF by aggregating the Thomson Reuters 13F database. The institutions that file 13F forms report

[6] Our sample includes U.S. equity ETFs with various legal structures, including ETFs that are organized as open-end mutual funds (e.g., the iShares Core S&P 500 ETF, IVV), unit investment trusts (e.g., the SPDR S&P 500 ETF Trust, SPY), and share classes of open-end mutual funds (e.g., the Vanguard 500 Index Fund ETF, VOO).

the assets for which they have investment discretion, meaning the institutional investment manager determines which securities are bought or sold. We calculate the institutional ownership percentage for each ETF-quarter by scaling total institutional holdings by market capitalization plus short interest.[7]

We classify ETFs into six mutually exclusive categories based on their strategies: Index, Sector Index, Quasi-Index, Active, Sector Active, and Smart Beta. We hand classify each ETF in the sample based on Lipper codes and fund descriptions from ETF.com and ETFDB.com. Index and Sector Index ETFs are those designed to closely track an index. Whereas many ETFs track indexes that are specifically designed and constructed for use by the ETF (Akey et al., 2021; Huang, Song, & Xiang, 2023), we only classify funds as Index or Sector Index ETFs if they track standard indexes from well-known index providers (CRSP, FTSE Russell, Morningstar, MSCI, S&P Dow Jones, or Wilshire) or an exchange (Nasdaq or New York Stock Exchange). Among funds tracking these standard indexes, ETFs with sector Lipper codes are classified into Sector Index and all others into Index.[8]

Quasi-Index ETFs follow relatively straightforward rule-based strategies, but they do not directly track a previously established index. Examples of Quasi-Index ETFs are the Guggenheim S&P 500 Equal Weight ETF (RSP), the SPDR S&P 500 Buyback ETF (SPYB), and the SPDR S&P 500 High Dividend ETF (SPYD). Active ETFs follow more complicated proprietary strategies or have actively managed portfolios, and Sector Active ETFs are those with a sector Lipper code but that do not follow a standard index. Finally, Smart Beta funds are identified as such by ETF.com, and we hand collect information on each ETF's stated strategy. Collectively, these ETFs claim exposures to cross-sectional factors related to value, growth, small cap, momentum, profitability, quality, and low volatility.[9]

[7]We correct for known errors in the database (e.g., Sias, Turtle, & Zykaj, 2016).

[8]The U.S. ETF sectors are Basic Materials, Consumer Goods, Consumer Services, Energy MLP, Financial Services, Health & Biotechnology, Industrials, Natural Resources, Real Estate, Science & Technology, Telecommunications, and Utilities. We reclassify Energy MLP ETFs as Natural Resources ETFs because the Energy MLP sector is relatively small and does not have a natural benchmark in the data as described further below.

[9]Several Index ETFs track small cap indexes such as the S&P 600. These ETFs could reasonably be considered to be either small cap Smart Beta funds or Index funds. We follow the ETF.com classification system to designate these funds as Index ETFs rather than Smart Beta ETFs. ETFs that track, for example, the S&P 500 Value index are classified as Smart Beta by ETF.com, and we follow this classification system.

Each ETF is assigned a benchmark to create performance and uniqueness measures. The benchmarks depend on the ETF category, and we describe how we use these benchmarks in Section 2.2. For the Smart Beta ETFs, we use daily return data for a set of commonly used factors from the asset pricing literature that mirror the stated Smart Beta strategies. The MKT, SMB, HML, and RMW factors of Fama and French (2015) and the MOM factor are from Kenneth French's website. The BAB factor of Frazzini and Pedersen (2014) and the QMJ factor of Asness, Frazzini, and Pedersen (2019) are from AQR's website. We include as factors HML for both value and growth ETFs, SMB for small cap, MOM for momentum, RMW for profitability, QMJ for quality, and BAB for low volatility.

For the remaining categories we use peer-based benchmarks in the spirit of Berk and van Binsbergen (2015). Our primary benchmarks are Vanguard ETFs, which track highly diversified indexes with low expense ratios. The Vanguard benchmark ETFs have inception dates ranging from January 2004 to August 2006, such that they span most of our sample. For the period prior to the existence of a Vanguard ETF in a given Lipper category, we assign the ETF with the earliest inception date (always a SPDR or iShares fund) as the benchmark ETF for that category. We use daily return data from these benchmark ETFs to create our measures.

Each Index ETF is matched to a Large-Cap Balanced, Mid-Cap Balanced, or Small-Cap Balanced benchmark ETF. To create benchmarks for Quasi-Index and Active ETFs, we use nine ETFs in the two-dimensional style grid of Large-Cap, Mid-Cap, and Small-Cap interacted with Value, Balanced, and Growth as well as a high dividend yield ETF. We detail the construction of the Quasi-Index and Active benchmarks in Section 2.2.3. The Sector Index and Sector Active ETFs are each assigned an ETF from the same sector as a benchmark.[10]

[10]The full set of Vanguard benchmarks is VAW, VB, VBK, VBR, VCR, VDC, VDE, VFH, VGT, VHT, VIS, VNQ, VO, VOE, VOT, VOX, VPU, VTV, VUG, VV, and VYM. The set of iShares and SPDR benchmarks for the pre-Vanguard periods is DVY, ICF, IJK, IUSV, IVW, IWM, IWN, IWO, IWS, IYM, IYZ, MDY, SPY, XLE, XLF, XLI, XLK, XLP, XLU, XLV, and XLY. We reclassify funds in the Lipper category "S&P 500 Index Funds" as "Large Cap Core" funds because SPY is the natural first mover for Large-Cap Balanced style.

2.2 Performance and Uniqueness Measures

We create measures of performance and uniqueness. Given that ETFs in different categories can have very different strategies and goals, we adopt category-specific approaches to calculating and interpreting these measures. This section describes measures for each category.

2.2.1 Index ETFs

We calculate performance and uniqueness measures for Index ETFs relative to the benchmark Index ETFs that are described in Section 2.1. Specifically, we use the following regression,

$$R_{i,t} = \alpha_i + \beta_i R_{BENCH,t} + \epsilon_{i,t}, \tag{1}$$

in which $R_{i,t}$ is the daily ETF excess return and $R_{BENCH,t}$ is the daily excess return on the benchmark ETF. Each regression uses daily data over the past 12 months. We require that each fund has at least 120 daily return observations during this period to estimate the regression. The alpha from this regression measures abnormal performance relative to the benchmark, which can reflect operational efficiencies and costs for Index ETFs. Uniqueness is calculated as $(1 - R^2)$, making it inversely related to the regression R^2 from equation (1). Given that investors in Index ETFs are likely seeking funds that closely track a diversified index, they may prefer a low uniqueness measure for Index ETFs.

2.2.2 Sector Index and Sector Active ETFs

We estimate a regression for each Sector Index or Sector Active ETF following equation (1) with the sector-specific benchmark ETF. Alpha and $(1 - R^2)$ from this regression are the performance and uniqueness measures.

2.2.3 Quasi-Index and Active ETFs

Quasi-Index and Active ETFs in our sample follow a variety of strategies that range from simple to complex. To account for this strategy variation, we use a relatively large set of ten benchmark

ETFs that span many potential strategies. As described in Section 2.1, these ten ETFs include nine funds in the style grid and a dividend yield ETF. For each Quasi-Index or Active ETF, we estimate the regression

$$R_{i,t} = \alpha_i + \sum_{j=1}^{10} \beta_{i,j} R_{BENCH(j),t} + \epsilon_{i,t}. \tag{2}$$

This regression estimates the portfolio of benchmark ETFs that most closely mimics the returns of the ETF under consideration. A Quasi-Index or Active ETF that is nearly perfectly spanned by the benchmarks provides relatively little value in terms of helping to complete the market. More unique ETFs with higher $(1 - R^2)$ may be desirable to investors for these categories. Alpha is informative about the ETF's performance relative to the fitted benchmark.

2.2.4 Smart Beta ETFs

We measure the abnormal returns and strategy uniqueness of Smart Beta ETFs using a matched factor model regression. Specifically, we estimate a restricted version of the following general regression:

$$\begin{aligned} R_{i,t} =& \alpha_i + \beta_{i,MKT} R_{MKT,t} + \beta_{i,SMB} R_{SMB,t} + \beta_{i,HML} R_{HML,t} + \beta_{i,MOM} R_{MOM,t} \\ &+ \beta_{i,RMW} R_{RMW,t} + \beta_{i,QMJ} R_{QMJ,t} + \beta_{i,BAB} R_{BAB,t} + \epsilon_{i,t}. \end{aligned} \tag{3}$$

For each Smart Beta ETF, we estimate a restricted version of the regression in equation (3) that only includes the market factor and the factors that are associated with the ETF's reported strategy. For example, for an ETF that claims value and small cap strategies, we include the MKT, HML, and SMB factors. Each factor model regression uses daily data over the past 12 months.

We measure performance as alpha and uniqueness as $(1 - R^2)$. Given that the factor model includes the factors that are associated with a Smart Beta ETF's claimed strategy, low strategy uniqueness is consistent with the ETF delivering on its strategy with relatively little idiosyncratic risk. As such, lower uniqueness may be desirable for investors in Smart Beta funds.

2.3 Sample Characteristics

Table 1 displays the number and total market capitalization of ETFs in each of the six categories for each year. The ETF market originated with a small set of Index and Sector Index ETFs. The substantial assets drawn by these ETFs invited competition from new fund sponsors and additional listings from early sponsors, and the Index and Sector Index categories quickly grew in the early years of the ETF market. As the market progressed, many ETFs began to track custom-built indexes, and the Securities and Exchange Commission granted conditional regulatory approval to actively managed ETFs beginning in February 2008.[11] In recent years, large numbers of Quasi-Index, Active, Sector Active, and Smart Beta ETFs have been listed, whereas the set of Index and Sector Index ETFs has been relatively stable.[12] Newer entrants into the Quasi-Index, Active, Sector Active, and Smart Beta categories have filled the ETF market with a wide variety of stated strategies that promise investors unique exposures. As of the end of our sample, the 39 Index ETFs (9% of listed funds) combine to manage over $1.0 trillion (52% of total market capitalization). The remaining categories contain a multitude of ETFs, most of which are much smaller than the average Index ETF. Recent growth in the Smart Beta ETF market is particularly notable, and the 144 Smart Beta funds (32% of listed funds) collectively manage $0.4 trillion (22% of total market capitalization) by the end of the sample period.[13]

[Table 1 here]

Table 2 summarizes ETF characteristics across categories. The table shows counts of ETFs and observations in our sample and the sample means of fund characteristics. The dependent variable in each panel regression in Section 3.2 is one of the following three: the log of market capitalization, the log of institutional market capitalization (i.e., the total value of the ETF shares held in institutionally managed accounts), or flow (i.e., the percentage growth in new assets following Dannhauser and Pontiff, 2021). We consider several additional characteristics to better understand the main drivers of ETF size. Fees are measured by the expense ratio. We include bid-ask spread

[11] See `https://www.sec.gov/rules/proposed/2008/33-8901.pdf`.

[12] Recent ETF market growth is consistent with Betermier, Schumacher, and Shahrad (2023), who find mutual fund proliferation is driven by incumbent firms' efforts to "fill up the style grid."

[13] Table B1 provides additional details about the proportions of sector and Smart Beta strategies of ETFs in the sample.

and trading turnover as liquidity measures. The average bid-ask spread is calculated as a percentage of NAV, and trading turnover is defined as the average shares traded divided by the average shares outstanding. In addition to measuring the secondary-market turnover of an ETF with trading turnover, we measure its internal turnover (i.e., how often the fund changes its positions) via the turnover ratio.

[Table 2 here]

We include three measures of investor awareness. ETF age is the number of years since the inception date. Search volume is calculated each quarter as the average monthly Google Keyword Planner volume for the ETF ticker from Keywords Everywhere. Finally, sponsor tilt is an ETF-level variable that captures the effect from 13F institutions' tendencies to hold ETFs from the same sponsor. For a given ETF, sponsor tilt measures the relation across 13F institutions between the holdings in the ETF and investments in same sponsor ETFs (excluding the ETF under consideration).[14]

As expected, Table 2 indicates that Index and Sector Index ETFs are larger, cheaper, more liquid, and less unique than their Active and Sector Active counterparts. The Quasi-Index and Smart Beta ETFs tend to roughly fall between these groups in size, fees, liquidity, and uniqueness. Table 2 also shows that ETFs in each category gained large inflows from investors during our sample period, consistent with the rapid growth of the ETF market reported in Table 1. Average flow ranges from just under 7% per quarter (Sector Index and Quasi-Index) to nearly 11% per quarter (Sector Active). These figures further underscore the popularity and growing importance of the ETF market in the modern investment landscape.

3 Results

Section 3.1 presents information about dominated ETFs and their prevalence in the market. Section 3.2 studies investor allocations to the dominated ETFs. Section 3.3 considers how dominated ETFs fit into the ETF ecosystem. Section 3.4 compiles the aggregate costs associated with invest-

[14] Detailed variable descriptions are in Table A1 of the appendix.

ments in these funds.

3.1 Existence of Dominated ETFs

We identify dominated ETFs as those for which a highly correlated, lower-fee, higher-liquidity ETF exists. We calculate return correlations using daily returns over the past 12 months, and we require at least 120 days of returns. We define two ETFs to be highly correlated if their correlation exceeds 95%.[15] Fee comparisons are based on a weak inequality of expense ratios. Liquidity comparisons use both average bid-ask spreads and average dollar trading volume. An ETF must have a lower bid-ask spread and higher volume than a competing fund to be classified as more liquid.

As an illustration of our dominated ETF classifications, consider the three largest Index ETFs that track the S&P 500 index during our sample period: IVV, SPY, and VOO. The ETFs are always highly correlated such that they are candidates for domination. Still, none is dominated in most of the recent quarters in our sample. Taking the fourth quarter of 2017 as an example, VOO charged the lowest expense ratio at 0.04%, followed by IVV at 0.05% and SPY at 0.09%. Although SPY is the most expensive of the three ETFs, it is also more liquid than IVV and VOO such that it is not dominated by either fund. IVV is cheaper than SPY and more liquid than VOO, and VOO is cheaper than both IVV and SPY. Hence, none is dominated in both fees and liquidity during this quarter. IVV subsequently lowered its expense ratio to 0.04% in the second quarter of 2018, matching the low fee of VOO. In this quarter, VOO is dominated by IVV, which is more liquid and equally cheap, but it is not dominated by SPY, which is more expensive.

Figure 3 provides information about ETF classifications throughout our sample period. Panel A shows the percentage of ETFs that are classified as dominated as well as the percentages for three types of ETFs that are not dominated: those with the lowest fees among their group of highly correlated ETFs, those with higher liquidity than related ETFs that have lower fees, and those that are unique in the sense that no other ETF is highly correlated. Panel B repeats the analysis with total market capitalization.

[15] To ensure we identify very similar peer funds, we use the 95% correlation threshold that is more stringent than the 90% threshold used by Khomyn et al. (2024) to identify close competitors.

[Figure 3 here]

Figure 3 demonstrates that significant capital is allocated to a large number of dominated ETFs. In the very early days of the ETF market, funds faced little competition from highly correlated ETFs and none were dominated. Dominated ETFs subsequently became prevalent as the market grew and more competing ETFs were listed. Since the late 2000s, the proportion of dominated ETFs has been relatively stable. About 40% of ETFs are dominated in the last quarter of our sample. These dominated ETFs collectively manage about 46% of ETF assets, totaling \$0.9 trillion of the \$1.9 trillion in assets under management. Large investments in dominated ETFs have persisted in the market.

The remaining types of ETFs in Figure 3 provide insights into the funds that are not dominated. Many ETFs are not highly correlated with any other ETF. These unique funds make up nearly half the sample on average and 46% of the sample in the last quarter. However, these unique ETFs tend to be small, and they collectively manage only 4% of total assets by 2018. The lowest-fee ETFs are 6% of funds and manage 5% of total assets. The highly liquid ETFs, which are studied by Khomyn et al. (2024), are relatively few in number (8% of the last-quarter sample) but manage about half of ETF assets (46%).

Figure 4 plots the inception dates for the 567 ETFs in our sample by Lipper category. The black dots indicate funds that are never dominated throughout our sample period. Yellow funds are dominated at in at least one but in less than half of quarters, orange in at least half of but not all quarters, and red are always dominated. Figure 4 illustrates several features of the evolution of the ETF market. Two patterns at the aggregate ETF market level are apparent. First, the proliferation of ETFs later in our sample, which was seen in Table 1, is reflected in the figure. Second, there are two periods of slowdowns in ETF issuance as a whole following the burst of the Internet bubble and the financial crisis.

[Figure 4 here]

Figure 4 shows additional interesting patterns within Lipper categories. Among sector funds, there is a wave of Science & Technology initiations in the late 1999s and early 2000s corresponding to the Internet boom. The rapid increases in oil prices in the mid 2000s and the early 2010s also appear

to generate clusters of new Natural Resources funds. These patterns indicate that ETF sponsors are responding to past strategy returns when issuing new ETFs.[16] A group of new Equity Income ETFs arose in the early 2010s along with revived investor preferences for dividends.[17] The timing of these ETF launches is consistent with the finding of Ben-David et al. (2023) that specialized ETFs cater to investor sentiment on investment themes. These clusters of initiations also have higher proportions of dominated ETFs compared with other initiations, which is suggestive that fund providers are simply trying to participate in broader market trends in these strategies.

Finally, Figure 4 reveals substantial commonality in the precise timing of ETF inceptions across Lipper categories. For example, we observe several instances in which a new ETF is launched in nearly every sector on the same day. This pattern reflects behavior at the ETF sponsor level, as families enter the ETF market or expand their set of offerings to complete their fund lineups and market to their own, often sticky, investors. Of the early SPDR offerings in the 1990s, several have maintained very high liquidity and have never been dominated. Nearly every subsequent large family's foray into the ETF market resulted in broad offerings of ETFs that were almost all dominated at some point after inception. Some families (e.g., Fidelity) quickly adopted low-fee approaches and were dominated for only short periods.

Table 3 compares dominated and dominant ETFs. Panel A reports the number of distinct ETFs and the proportions of ETF-quarter observations for dominated and dominant funds that occur within each of the six categories. A striking number of the 567 total funds in our sample are dominated in at least one quarter, as 322 distinct ETFs have been dominated by 164 distinct ETFs during our sample. Dominated ETFs often come from the Smart Beta category (41%), whereas dominant ETFs are usually Index ETFs (62%). This finding that most dominant ETFs simply track an index is informative about the nature of dominated ETFs. Dominated ETFs are predominantly from categories of funds that advertise more complex investment strategies, yet the high correlation of their strategy returns with broad index returns is symptomatic of closet indexing.

[16] Consistent with these patterns, we find that ETF initiations are positively related to recent returns in a Lipper category in unreported results.

[17] See `https://www.forbes.com/sites/thestreet/2012/02/16/dividend-stocks-will-be-winners-for-a-whole-decade/`.

[Table 3 here]

Panel B of Table 3 compares the characteristics of dominated ETFs versus their dominant counterparts. By construction, dominated ETFs have higher expense ratios, higher bid-ask spreads, and lower volume. The reported averages reveal economically significant differences in these characteristics. The average fees of dominant funds (0.12% per year) are about a third of those for dominated ETFs (0.34%), and the dominant ETFs are also highly liquid in comparison. Dominated funds are significantly smaller than their dominant counterparts. Dominated ETFs also have lower values for our three measures of investor awareness, as they are younger and have lower search volume and sponsor tilt measures.

To a large degree, the differences in characteristics in Panel B reflect the fact that many ETFs are dominated by large, well-known Index ETFs. Figure 5 characterizes the set of dominant ETFs that first dominated each of the 322 ETFs. Panel A of Figure 5 shows that most dominated ETFs (216 of the 322) are initially dominated by a dominant fund with over $1 billion in assets. A large majority (204 of the 322) of these dominant funds have existed for at least five years, as shown in Panel B. As such, dominated ETFs tend to be first dominated by large, established funds. Panel C shows the distribution of the age of the dominant ETFs relative to the dominated ETFs. Only 47 of the dominated ETFs are first dominated by a younger fund. Many are dominated by funds that are at least five years older.[18] In short, dominated ETFs are almost always dominated by well-established funds rather than by new entrants.

[Figure 5 here]

Panel B of Table 3 also reports that dominated ETFs attract significantly higher flows (6% per quarter on average) compared with dominant ETFs (3% per quarter). A potential reason for dominated ETFs attracting these flows is that they could outperform relative to their peers. The average alphas in Panel B provide initial evidence. Dominated ETFs underperform dominated ETFs at the 5% significance level, which is inconsistent with the outperformance conjecture. However, the 0.07% gap in alphas is economically smaller than the 0.22% gap in expense ratios. At first

[18]The dominated-dominant fund pairs are based on the dominant fund with the lowest fee if the dominated ETF is dominated by multiple funds. Among all dominant funds, we find that 240 (196) [83] of the 322 dominated funds are dominated by at least one ETF that is at least two (five) [ten] years older in the first quarter of domination.

glance, the dominated ETFs appear to overcome some performance drag from fees.

We delve into fund performance. We use alphas estimated from daily data by necessity given short estimation windows, but we note the potential issues with interpreting averages and conditional averages (i.e., alphas) using daily returns (e.g., Blume & Stambaugh, 1983; Asparouhova, Bessembinder, & Kalcheva, 2010, 2013; Boguth, Carlson, Fisher, & Simutin, 2016). Fund investors ultimately care about compounded returns over their holding periods (Bessembinder, Cooper, & Zhang, 2023), and daily performance measures are often misleading. We therefore report average compounded annual returns both net and gross of fees in Panel C of Table 3. On average, dominated ETFs underperform dominant ETFs by an insignificant 0.18% per year net of fees.[19] This average net return gap is of the same economic magnitude as the fee gap, and the average gross return gap is an insignificant 0.04% per year. These results do not support the conjecture that investors direct high flows to dominated ETFs due to outperformance. Rather, they are in line with a hypothesis that the dominated and dominant funds have equal expected returns before fees given that they execute highly correlated strategies. If the two funds deliver the same gross performance, the cheaper (dominant) fund will outperform the more expensive (dominated) fund net of fees.[20]

3.2 Success of Dominated ETFs

3.2.1 Dominated ETF Assets

The results in Section 3.1 show that dominated ETFs, in aggregate, manage substantial assets. We now turn to ETF-level evidence to study these allocations by investors. We study ETF size to test whether investors allocate fewer dollars to dominated ETFs when dominant alternatives exist. Investors in a dominated ETF can sell and immediately invest in a corresponding dominant ETF, so the excess costs from maintaining an allocation to the dominated ETF are avoidable. These excess costs depend on the total amount invested in the dominated ETF, such that fund size is a

[19] We find little difference between the gaps in alphas versus average daily returns, such that controlling for systematic risk exposure has little effect for interpreting the performance differences.

[20] In unreported results, we find that dominated ETFs do not offer more appealing risk characteristics compared with dominant ETFs in terms of standard deviation, skewness, or kurtosis. We also find evidence that investors in dominated ETFs display poor timing ability based on flow-weighted returns, calculated as either share-growth-adjusted return or internal rate of return as in Brown et al. (2021).

natural variable to study.

We study the relations between ETF size and fund characteristics using a panel regression for each of the six categories. The dependent variable is the log of the ETF's quarter-end market capitalization.[21] We include a large set of control variables to account for the relations between fund size and fees, liquidity, performance, strategy uniqueness, and investor awareness. Our primary independent variable is a dominated ETF indicator variable that we include in each specification to estimate the marginal effect of the existence of a dominant competitor after controlling for fund characteristics. We include quarter-year fixed effects and cluster standard errors at the quarter-year level.[22] When we consider economic magnitudes using one-standard-deviation changes in independent variables, the standard deviations account for the fixed effects such that they are interpretable as within-quarter-year standard deviations across ETFs in a given category.

Table 4 examines ETFs in the Index, Sector Index, Quasi-Index, Active, Sector Active, and Smart Beta categories.[23] Our primary hypothesis is that investors will invest less in dominated ETFs, all else equal, because of the existence of a dominant alternative. This hypothesis implies that the dominated ETF indicator variable should be negatively associated with ETF size after controlling for important fund characteristics related to fees, liquidity, performance, strategy uniqueness, and investor awareness. The results for Index and Sector Index ETFs in Table 4 are consistent with the hypothesized effects. Dominated Index ETFs are about 26% smaller (t-statistic of -3.50) than would otherwise be expected, and Sector Index ETFs are about 13% smaller (t-statistic of -2.01).[24] Investors successfully allocate less to dominated ETFs in the fee-salient index categories.

[21] We use the log of market cap to study the allocation of capital because the distribution of ETF size is highly skewed, but inferences are robust to using ETF market cap or percentage of total quarterly U.S. equity ETF assets as the dependent variable.

[22] In the internet appendix, we investigate alternative regression specifications. Our inferences are robust to including ETF fixed effects (Table B2) or ETF family fixed effects (Table B3). We also show robustness to clustering standard errors at the quarter-year and ETF levels (Table B4). Finally, we show our results are robust to using a continuous measure of excess fees for each dominated ETF relative to its dominant ETF (Table B5).

[23] The number of observations for the Sector Active category differs across Tables 2 and 4 because three singleton observations drop out with quarter-year fixed effects.

[24] These size calculations for the dominated indicator variable are $e^{-0.3022} - 1 = -0.26$ and $e^{-0.1447} - 1 = -0.13$. The size calculations for continuous variables multiply coefficients times within-quarter-year standard deviations in the exponent.

[Table 4 here]

The coefficient estimates for the Dominated indicator variable across the strategy-salient ETF categories are inconsistent with our hypothesis. The estimates are significantly positive for Quasi-Index, Active, Sector Active, and Smart Beta ETFs, which implies that dominated funds are larger than would be expected given the other fund characteristics. The economic magnitudes are large at 67% for Quasi-Index ETFs (t-statistic of 5.37), 231% for Active ETFs (t-statistic of 9.53), 33% for Sector Active ETFs (t-statistic of 4.71), and 125% for Smart Beta ETFs (t-statistic of 10.67). Dominated ETFs, which are directly competing for assets against dominant funds, are actually larger than would otherwise be expected for the strategy-salient categories.

The regressions that indicate significant excess sizes for dominated ETFs in Table 4 control for a number of important relations between fund characteristics and fund size. Expenses are strongly negatively related to fund assets for most categories, consistent with investors' preferences for lower-fee investment options. Within the Index category, a one-standard-deviation increase in the expense ratio is associated with a 29% decrease in ETF market cap (t-statistic of -8.90). The economic magnitudes are even larger for the Sector Index (39% decrease in size, t-statistic of -7.86), Quasi-Index (38% decrease, t-statistic of -19.54), and Smart Beta (34% decrease, t-statistic of -12.94) categories. ETF investors appear not to be cost sensitive for Active and Sector Active funds.

Table 4 also shows a role for liquidity. Within the Index category, indications of greater liquidity from lower bid-ask spreads and higher trading turnover are associated with larger ETF market cap. A one-standard-deviation improvement in liquidity is associated with an increase in ETF size of 32% for bid-ask spread (t-statistic of -2.50) and 45% for trading turnover (t-statistic of 6.42). Liquidity also appears particularly important for Sector Index, Sector Active, and Smart Beta ETFs. Among Quasi-Index and Active ETFs, on the other hand, the liquidity measures are not as consistently associated with ETF size.

We also find that trading in the underlying ETF portfolio is related to fund size. Among Active ETFs, investors allocate more to funds that are more active in trading (as measured by the turnover ratio). A one-standard-deviation increase in the turnover ratio is associated with an 17% increase

in size (t-statistic of 6.32) for these ETFs. In contrast, funds with less portfolio turnover are larger in the other categories (insignificantly so for Index ETFs).

Recent returns may be mechanically related to ETF size if existing investors are sticky, and return chasing behavior by investors could also produce a relation. We find that ETF size is significantly associated with the prior quarter return for Sector Index and Sector Active ETFs. These positive relations between prior quarter return and size in the sector categories is consistent with the style-level feedback trading documented by Broman (2022). The economic magnitudes for Sector Index and Sector Active ETFs are small and prior quarter return is not significantly related to size in the remaining categories, such that sticky investors and return chasing do not appear to be first-order determinants of ETF size.

We also include the performance and uniqueness measures from the benchmark analyses developed in Section 2.2. The coefficient estimate on alpha is significantly positive for the Quasi-Index and Sector Active categories and insignificantly positive for the Active category, suggesting benchmark-adjusted performance chasing for the more active funds. A one-standard deviation increase in alpha is associated with a 7% increase in size for Quasi-Index ETFs (t-statistic of 2.39) and 6% for Sector Active ETFs (t-statistic of 2.48). The coefficient estimates are negative for the Index, Sector Index, and Smart Beta categories. Taken as a whole, these results suggest that past abnormal performance explains relatively little variation in ETF allocations.

We predict that the relation between strategy uniqueness and ETF size will be negative for Index, Sector Index, and Smart Beta ETFs, as investors likely desire products in these categories that more closely track their stated strategies. This prediction is supported in the data. A one-standard-deviation decrease in uniqueness among Index ETFs is associated with an 98% increase in size (t-statistic of -9.14). Sector Index ETFs show a weaker relation between uniqueness and market capitalization with an implied 28% increase in size (t-statistic of -4.13). Finally, Smart Beta ETFs have an implied 45% increase in size (t-statistic of -10.19) with a one-standard-deviation decrease in uniqueness.

Surprisingly, Table 4 also shows that uniqueness and size are negatively related among Quasi-Index and Active ETFs. Ex ante, we expect a positive relation because investors in these cate-

gories are paying higher fees on average for funds with strategies that deviate from straight index investments. Nonetheless, we find economically large increases in size of 101% for Quasi-Index ETFs (t-statistic of -16.54) and 124% for Active ETFs (t-statistic of -13.87) associated with one-standard-deviation decreases in uniqueness. Given the higher fees for ETFs in these categories relative to their Index ETF peer benchmarks, the finding of a strong negative association between uniqueness and market cap is consistent with our observation that many dominated ETFs manage substantial assets. Investors display a preference for Quasi-Index and Active ETFs that more closely track low-cost alternatives even with the large differences in average fees. Only for the Sector Active category are more unique funds larger, and the magnitude of the effect is just 6% (t-statistic of 2.23).

Table 4 includes three fund characteristics related to investor awareness. Search costs may be important in fund selection (e.g., Hortaçsu & Syverson, 2004; Roussanov et al., 2021), and the salience of a particular ETF may help explain investor allocations. ETF age is likely positively related to investor awareness. Older ETFs initially competed in a less-crowded ETF market and may have been more salient to investors, and investors may remember owning these older funds in the past. We find that age is significantly positively associated with size across all categories. The economic magnitudes are large. For example, doubling the age of an Index ETF is associated with a 430% increase in size (t-statistic of 33.03). Age is likely related to several aspects of a fund, but this variable's strong positive relation with size provides initial evidence that funds with greater investor awareness attract more capital.

The remaining two awareness variables—search volume and sponsor tilt—are also positively and significantly related to ETF size across almost all categories. Internet search volume proxies for investor awareness and attention, and it likely captures retail investor awareness given the sheer number of retail investors and the fact that institutions have alternative platforms for information (e.g., Bloomberg). Sponsor tilt, on the other hand, is designed to measure the effect of institutional investor tendencies to invest in ETFs from the same sponsor. Sponsor tilt may also reflect an ETF family's advantages in marketing new funds to their existing investors. A one-standard-deviation increase in the log of search volume for Index ETFs, for example, is associated with a 22% increase

in market cap (t-statistic of 5.59). Search volume is insignificantly related to size for Sector Index and Active ETFs but positive and significant for the other categories. The coefficient estimate for sponsor tilt is significantly positive for each category. A one-standard-deviation increase in sponsor tilt is associated with a 36% increase in size (t-statistic of 8.31) for Index ETFs. Overall, these results indicate that investor awareness is a significant predictor of ETF size. This finding is consistent with a substantial role of search costs in determining allocations in the ETF market.[25]

Our analysis of dominated ETFs in Table 4 reveals a distinction between the relatively straightforward Index and Sector Index ETFs and the more specialized Quasi-Index, Active, Sector Active, and Smart Beta ETFs. On the one hand, dominated ETFs that track well-known indexes, whether non-sector or sector indexes, are statistically significantly smaller on average. Fees are likely salient to index investors, so investing goals and salient stimuli are aligned. These index investors successfully allocate less to dominated funds. On the other hand, dominated ETFs that promise more complex or active strategies manage statistically significant and economically large excess assets. Unique strategy descriptions and fund names may be prominent for investors in these categories, and decision makers may be distracted from value-relevant features like fees and high correlations with broad indexes. Bottom-up attention leads them astray. The dichotomy between index and active funds suggests that investors best identify dominated products when comparisons are simple and fund trait salience aligns with investment goals.

3.2.2 Dominated ETF Institutional Assets

Our finding that dominated ETFs are abnormally large is surprising given the favorable structure of the ETF market. These aggregate misallocations could, however, be driven by retail investors who have low financial literacy. Given the absence of advisor incentive misalignments, a natural hypothesis is that allocations to dominated ETFs should be smaller in institutionally managed accounts. To study the investment choices of institutional investors, we consider the average institutional

[25] In the internet appendix (Table B6), we introduce additional control variables relative to those in Table 4. ETFs that belong to large fund families may have more assets, so we control for the log of family size (excluding the ETF itself). We also control for whether ETFs allow for in-kind creation and redemption, which may affect tax efficiency, as well as whether a given fund has a focus on environmental, social, and governance (ESG) issues. Inferences about excess allocations to dominated ETFs are unchanged after including these additional fund characteristics.

holdings of dominated ETFs and the excess allocations to dominated funds by institutions.

Across ETF-quarters in our sample, institutions held 38% of dominated ETF shares versus the sample average of 40%. This first glance suggests that institutional investors do not shy away from dominated funds. Figure 6 plots the time series of the average institutional ownership across dominated and non-dominated ETFs. This figure implies that institutional and retail investors have consistently had similar allocations across dominated and non-dominated funds throughout our sample period. Institutional ownership in dominated funds is actually higher than in non-dominated funds at the end of our sample.

[Figure 6 here]

Table 5 reports estimates of the excess allocations to dominated ETFs in institutionally managed accounts. The dependent variable in each panel regression is the log of the ETF's quarter-end aggregate institutional holdings. Each regression includes all independent variables from the baseline regressions in Table 4. Inferences for the variables related to fees, liquidity, performance, strategy uniqueness, and investor awareness are similar to those using overall ETF size.

[Table 5 here]

Institutions appear similar to the overall pool of investors with respect to their allocations to dominated ETFs. They successfully reduce their allocations to dominated funds in the Index and Sector Index categories. Dominated Index ETFs receive institutional allocations that are about 37% smaller (t-statistic of -3.78), and allocations to dominated Sector Index ETFs are about 15% smaller (t-statistic of -1.73). In the strategy-salient categories, Table 5 shows that dominated ETFs garner significantly positive excess allocations within institutionally managed accounts. Institutional holdings are excessively high for dominated Quasi-Index (95% larger, t-statistic of 6.30), Active (188% larger, t-statistic of 5.09), Sector Active (21% larger, t-statistic of 2.54), and Smart Beta (137% larger, t-statistic of 9.90) ETFs. Table 5 provides little evidence that institutional allocations differ from those of investors at large. Financial professionals successfully reduce allocations to dominated products in the price-salient index fund categories, but they are unable to avoid dominated ETFs advertising more complex strategies.

3.2.3 Dominated ETF Flows

Our results to this point focus on ETF size because excess costs of dominated ETFs scale with ETF assets. Studying net fund flows gives additional insights into the active investment decisions of ETF investors. The growing ETF market has experienced large positive flows in aggregate. A rising tide lifts all boats, and we observe in Panel B of Table 3 that dominated ETFs have an unconditional average flow of about 6% per quarter. The literature has identified many important determinants of flows, however, so we test the hypothesis that flows to dominated funds are lower after controlling for important fund characteristics.

Table 6 reports results from panel regressions with flow as the dependent variable. We include the set of independent variables from our base specification in Table 4. We also include the lag of the log of market capitalization given evidence in the literature that larger funds tend to have lower percentage flow. The regression results suggest that some dominated ETFs receive lower flow. Dominated Index ETFs have 2% lower quarterly flow (statistically insignificant with a t-statistic of -0.82) and Sector Index funds have 3% lower flow (t-statistic of -2.22). These flow effects provide suggestive evidence that investors distinguish between dominated and non-dominated index ETFs when making investment decisions.

[Table 6 here]

The flow results for the strategy-salient categories are mixed. There is virtually no relation between flow and the dominated indicator for Quasi-Index funds, and the point estimates for Active and Sector Active funds are insignificantly positive at 2% per quarter for both categories. These results are inconsistent with the hypothesis that dominated funds should have lower net flows. In the Smart Beta category, dominated ETFs have 3% lower quarterly flow (t-statistic of -2.10), which provides evidence in favor of the hypothesis for these funds.

Our flow results for dominated funds control for other variables shown to be important for fund flows. Consistent with Clifford, Fulkerson, and Jordan (2014) and Dannhauser and Pontiff (2021), we observe higher flows for ETFs with higher trading turnover, higher past returns, younger age, and lower assets under management. The relation between fees and flows is somewhat more

complex. Among Index, Sector Index, and Smart Beta ETFs, a one-standard-deviation increase in expense ratio corresponds with 3%, 2%, and 2% lower quarterly flow, respectively. For Sector Active funds, on the other hand, flow is 2% higher for more expensive funds. Fees and flows are insignificantly related for Quasi-Index and Active funds. These results are generally consistent with Ben-David et al. (2023), who find that flows are negatively related to expenses for broad-based funds but insensitive to expenses for specialized funds.

Across all ETF categories, the estimated flow effects for dominated funds shown in Table 6 are relatively small in magnitude compared with the average quarterly flows reported in Table 2. While some investors may be diverting flows from dominated ETFs to competitors, their response seems too weak to overcome the overall growth of the ETF market. Rather than reaching a winner-takes-all outcome, we see a proliferation of growing funds—many of which are dominated—reaching a critical mass within the ETF market. Consistent with this notion, we find in untabulated results that few dominated funds liquidate during our sample. Of the 86 ETFs in our sample that close, just three were dominated at the time of closing and only 11 were ever dominated. The vast majority of liquidated funds were niche ETFs (e.g., the LocalShares Nashville Area ETF) that were unique and never reached critical mass. Despite their precarious position in the market, most dominated ETFs were able to ride the wave of ETF market growth to survive and thrive.

3.3 Dominated ETFs in the ETF Ecosystem

Our findings to this point show that dominated ETFs manage substantial assets and that dominated funds in non-index categories have significant excess assets. Institutional and retail investors alike are investing in these ETFs, and dominated funds face relatively little punishment from investor flows.

It is possible that our results relating to excess assets could be explained by dominated ETFs' place in the ETF ecosystem. Many dominated ETFs may, in some sense, be "barely dominated" by competing ETFs, such that investors are losing little from allocating to these dominated funds. Alternatively, the dominated funds could have played innovative roles in completing the ETF market before being mimicked by cheap new entrants from competing fund families. Some dominated funds

that were pioneers in a niche of the ETF market may enjoy a lasting early mover advantage even if they later become dominated, which could explain our findings of excess size for dominated ETFs.

Table 7 provides initial evidence on dominated ETFs' position in the market. The table reports the proportions of dominated ETF observations that fall into non-overlapping subgroups for each of five fund characteristics.

[Table 7 here]

The first grouping is based on the relative fees of dominated versus dominant ETFs. The Dominated 1x group contains any dominated ETF that has an expense ratio that ranges from one to two times that of its cheapest dominant fund. The Dominated 2x (3x) group has funds with fees that are more than two times (three times) as high but no more than three times (four times) higher. The Dominated 4x group only contains dominated ETFs with fees that exceed four times those of the matching dominant funds. Based on this grouping, the Dominated 1x group is the "least dominated," whereas the Dominated 4x group charges fees that seem exorbitant. In each category, Table 7 shows that a minority of dominated ETFs fall into the Dominated 1x group, such that most dominated funds have fees that exceed two times those of their dominant counterparts. Dominated 4x ETFs are particularly prevalent in the strategy-salient categories in which dominated funds have excess assets—Quasi-Index (59% of observations), Active (83%), Sector Active (25%), and Smart Beta (38%).

The second and third groupings consider each ETF's own history of being dominated. The Always Dominated group is the set of dominated fund observations for which the ETF has been dominated in every sample quarter to date. Mostly Dominated are those that were dominated in at least half of but not all quarters to date, and Sometimes Dominated are the remaining dominated funds. Table 7 reports that well over half of observations fall into the Always Dominated or Mostly Dominated groups in each category. The 1st Year Dominated to 4th+ Year Dominated groups sort funds based on the timing of their first quarter of being dominated. Most dominated ETFs are dominated within the first two years. These findings indicate that the dominated ETFs in our sample are persistently dominated beginning early in their lives.

The fourth grouping considers early entrants. Early Entrant Dominated includes all ETFs that

are currently dominated but were also an early mover in their market segment, defined as being one of the first two ETFs in the Lipper category or having an inception date within the first two years of the first mover in the Lipper category. Late Entrant Dominated includes all other dominated ETFs. Early entrants are the most prevalent in the Index (40%), Sector Index (55%), and Smart Beta (33%) categories. Most dominated ETFs are late entrants, as can be seen in Figure 4.

Finally, the fifth grouping examines competition in the context of fund families. Several fund families offer a multitude of ETFs, and crowded fund menus create the potential for a fund to be dominated within its own family. Family Dominated includes all observations in which the dominated ETF is dominated by at least one fund in its own family, and Non-Family Dominated includes all other observations. Within-family domination is most prevalent in the Index category (83%) and least prevalent in the Sector Index (24%) and Sector Active (20%) categories.

Table 8 studies whether dominated ETFs in any particular groups drive our findings of significant excess assets. These panel regressions mirror those in Table 4 but replace the Dominated indicator variable with a set of indicator variables based on each of the groups in Table 7.
[Table 8 here]

The results in Panel A of Table 8 demonstrate that our main findings hold across fee groups. The Index ETFs in the Dominated 1x group, which have fees that are no more than twice as large as the dominant ETF, have insignificant excess size. At higher fee levels, dominated Index ETFs are significantly smaller. The Dominated 2x group funds are 40% smaller (t-statistic of -5.84), the 3x funds are 58% smaller (t-statistic of -11.56), and the 4x funds are 69% smaller (t-statistic of -9.62). A similar pattern emerges for Sector Index funds, as those with the higher fee levels have large, significant negative coefficients.

For the strategy-salient categories in Panel A, the dominated ETFs have significant excess size in almost all cases (with the Dominated 3x group of Sector Active funds being the only exception). Even among the highest-fee dominated funds (i.e., the Dominated 4x group), we estimate significantly positive excess sizes of 48% for Quasi-Index funds (t-statistic of 4.07), 260% for Active funds (t-statistic of 10.02), 71% for Sector Active funds (t-statistic of 5.97), and 125% for Smart Beta funds (t-statistic of 9.97). As such, we find evidence that investors do not punish dominated

ETFs in the categories with strategy salience even when each of these funds has egregiously high fees relative to a cheaper, more liquid, and highly correlated dominant fund.

Panels B and C of Table 8 show that our results hold for dominated ETFs that are consistently dominated from early on. Surprisingly, the largest excess size coefficient in each category in Panel B occurs for the worst offenders—those Always Dominated ETFs that have been dominated every quarter since entering our sample. Panel C reports that the 1st Year Dominated ETFs in the Quasi-Index, Active, Sector Active, and Smart Beta categories all have significant excess size. These results rule out the possibility that our results are driven by dominated ETFs that were undercut by mimicking new entrants.

Panel D splits ETFs by early entrant status. Our main conclusions still hold for both early and late entrants. Early movers have higher dominated coefficients than late movers in nearly all categories, consistent with these funds enjoying competitive benefits from being an early entrant. But, the late mover coefficients demonstrate our results on ETF size are not driven by a subset of dominated funds that were originally pioneers but have been overtaken by new rival funds.

Panel E of Table 8 examines competition within family and across families. For the Index and Sector Index categories, dominated ETFs are significantly smaller only when they are dominated within family. This finding raises the possibility that some investors are primarily making comparisons across funds within a given family rather than across the investable universe. The significant excess assets for dominated ETFs in the Quasi-Index, Active, Sector Active, and Smart Beta categories underscore the difficulty for investors to make comparisons across these funds, even when they are from the same family.

Table 8 paints a rather bleak picture of investor allocations to ETFs. It would be understandable if investors are relatively insensitive to small differences in fees or if they are slow to realize that new competition has relegated their familiar funds to dominated status. Instead, investors are, on average, allocating excess capital to the most egregious offenders. ETFs with fees that exceed four times that of a dominant fund and ETFs that are dominated from the outset are attracting substantial capital, at least in the categories of funds in which strategy differentiation is most salient

for investors.[26]

When we consider ETF sponsor incentives, these results suggest contrasting approaches to achieving success. As a case in point, the iShares US Technology ETF (IYW) is consistently dominated by the Technology Select Sector SPDR Fund (XLK) and the Vanguard Information Technology Index Fund (VGT). At the end of our sample, IYW generates an annualized $18 million in fees with a 0.43% expense ratio on $4 billion in assets. XLK and VGT generate $28 million and $20 million in fees, respectively, despite their much larger sizes of $22 billion and $20 billion in assets. Even though SPDR and Vanguard attract five times the assets with significantly lower expense ratios of 0.13% and 0.10%, the three funds are each profitable and generate similar fee income.

3.4 Costs of Dominated ETFs

To this point, we demonstrate that dominated ETFs are numerous and that they collectively manage substantial capital (Section 3.1), show that dominated ETFs in the more complex categories attract excess assets (Section 3.2), and find that even those funds with the most egregious fees have large excess sizes (Section 3.3). These results suggest large economic costs to ETF investors from investing in dominated funds. In this section, we analyze the aggregate costs of dominated ETFs.

Figure 7 shows the time series of the total fee income for the dominated, lowest fee, liquid, and unique ETFs introduced in Figure 3. Highly liquid funds with relatively high fees accrued $6.0 billion of ETF fees during our sample. These are the funds studied by Khomyn et al. (2024), who demonstrate that high-fee funds can survive and thrive so long as they attract short-horizon, liquidity-conscious investors. According to Khomyn et al. (2024), the large aggregate fees for this set of funds includes rents captured by large, highly liquid first movers. The lowest fee and unique funds generated much less total income at $1.1 billion and $2.0 billion, respectively.

[Figure 7 here]

Dominated ETFs garner nearly half (46%) of the total fees across all ETFs, and these dominated

[26] In the internet appendix, we show that the primary conclusions extend to specifications with log institutional market cap (Table B7) or flow (Table B8) as the dependent variable.

funds racked up $7.8 billion in fees during our sample period. Fee income is growing over time with the ETF market, and dominated funds charged an annualized $1.3 billion in the last quarter of our sample compared with $1.6 billion across all non-dominated ETFs.[27]

We primarily concentrate on the portion of dominated ETF fees that is avoidable. That is, an investor can disinvest in the dominated fund and switch to its dominant fund to achieve lower fees with an added benefit of better liquidity. ETFs with relatively high fees and low liquidity are often dominated by multiple highly correlated ETFs. When we analyze the costs of dominated ETFs, we compare each dominated ETF with the lowest-fee fund in the set of dominant ETFs.[28] The excess fee income for a dominated ETF is calculated as the difference between the expense ratios of the dominated and dominant funds scaled by dominated fund assets.

Figure 8 displays the time series of quarterly excess fees for dominated ETFs, and Panel A of Table 9 tabulates the excess fees across all dominated funds. Investors in dominated funds were charged, on average, $255 million more per year than they would have been charged by cheaper, more liquid, highly correlated funds. Extra fees in the last quarter of our sample are more than three times the average at an annualized $792 million. Throughout the sample, we find that $4.7 billion of the $7.8 billion in total fees paid by dominated fund investors was avoidable.

[Figure 8 here]

[Table 9 here]

Figure 8 also plots the excess trading costs of dominated ETFs, which are calculated as one-half of the difference between the bid-ask spreads of the dominated and dominant funds scaled by the quarterly trading volume of the dominated fund. Widening bid-ask spreads and high trading volume caused a spike in excess trading costs during the financial crisis, and excess trading costs were nearly an order of magnitude higher than excess fees. The evidence suggests that expense ratios drive the cost of dominated ETFs in normal times, but trading costs loom large in liquidity crisis periods.

[27] In unreported results, we find that versions of Figure 7 that plot total fees paid by institutional investors or retail investors are visually similar to Figure 7.

[28] If multiple dominant ETFs share the lowest fee, we choose the ETF with the lowest bid-ask spread among this group. An alternative approach of comparing each dominated fund to the dominant fund with the lowest bid-ask spread gives qualitatively similar results.

We also examine excess fees within the groups of dominated ETFs introduced in Section 3.3. Panel A of Figure 9 repeats total excess fees of dominated ETFs from Figure 8. Panels B to F of Figure 9 and Table 9 split total excess fees for each of the five groupings.

[Figure 9 here]

Our findings for these groupings add to our overall discouragement with existing investor allocations to ETFs. Panel B of Figure 9 and Panel B of Table 9 show that the dominated ETFs with egregious fees drive most of the excess costs. Funds in the Dominated 3x and 4x categories have generated $1.0 billion and $2.2 billion, respectively, of the total $4.7 billion in excess fees. Panel C demonstrates that almost all of the excess costs are from ETFs that are persistently dominated, as the Mostly and Always Dominated groups charged excess fee totals of $3.2 billion and $0.8 billion, respectively. Panel D shows that dominated ETFs that were quickly dominated by the first or second year make up the majority of excess fees at $1.7 billion and $1.3 billion, respectively. Early entrants in Panel E account for $2.4 billion of the excess fees, but ETFs that were late to the game still gained $2.3 billion of the total. Finally, Panel F demonstrates that ETFs that are dominated by other funds within their own family charged $3.0 billion in excess fees.

Our results, as a whole, suggest that the proliferation of listed ETFs with increasingly complex stated strategies, which is a consequence of the 2008 regulatory changes facilitating active ETF strategies, is costing investors billions. Investors seem to overweight prominent descriptions of unique strategies relative to less salient fund features like high fees and high return correlations with broad indexes when making their investment decisions. The substantial assets garnered by high-fee dominated ETFs along with the low costs of launching a new ETF (which further declined in 2019 with SEC Rule 6c-11) seem to provide ETF sponsors with clear incentives to increase their offerings.[29] Improvements in investor allocations would reduce these incentives. We believe investors—both retail and institutional—would benefit from focusing on a set of low-cost, easy-to-compare index ETFs.

[29]For evidence on the effects of the 2019 SEC rule, see Morningstar's Guide to US Active ETFs (`https://www.morningstar.com/business/insights/research/guide-to-us-active-etfs`).

4 Conclusion

This paper studies dominated products in the U.S. equity ETF market. The ETF market provides an ideal setting for examining dominated products because ETFs have no agency conflicts from incentive fees. Despite this market feature, we find that retail and institutional investors make substantial investments in a large number of ETFs that are dominated by highly correlated, lower-fee, higher-liquidity ETFs.

We find evidence that investors are able to identify and allocate less capital to dominated Index and Sector Index ETFs, which is consistent with fees being particularly salient in the index fund market. Dominated ETFs in non-index categories, however, counterintuitively receive excess allocations from investors. This finding persists after controlling for a multitude of fund characteristics relating to fees, liquidity, turnover, performance, uniqueness, and investor awareness. Consistent with models of economic choice with bottom-up attention (Bordalo et al., 2020, 2022), investors seem to overweight unique strategy descriptions of these funds relative to important, but less salient, features like fees and correlations with broad indexes.

The aggregate cost to investors of allocations to dominated ETFs is economically large. We estimate excess fees to dominated ETFs of $4.7 billion during our sample period, and these excess costs are only increasing with time and ETF market complexity. The excess fees are primarily charged by dominated funds that charge egregiously high fees and are persistently dominated beginning early in their lives.

We draw two primary conclusions from our findings. First, growing complexity in the ETF market is costly to investors. Investors—both retail and institutional—would benefit from restricting their decision making processes to a small set of low-cost, high-liquidity ETFs. Regulators could also consider rules to rein in the proliferation of new, more complex ETFs. Second, the ETF market provides insights into potential gains from eliminating incentive fees and strengthening fiduciary standards. Unconflicted financial professionals are making the same mistakes as retail investors with respect to dominated products in the ETF market at a substantial cost to their investors. This finding implies limitations on the real-world benefits of eliminating advisor-client conflicts of

interest.

References

Akey, P., Robertson, A., & Simutin, M. (2021). Closet active management of passive funds. *Working Paper, University of Toronto*.

Allen, J., Clark, R., & Houde, J.-F. (2014). Price dispersion in mortgage markets. *Journal of Industrial Economics*, *62*(3), 377–416.

Allen, J., Clark, R., & Houde, J.-F. (2019). Search frictions and market power in negotiated-price markets. *Journal of Political Economy*, *127*(4), 1550–1598.

Asness, C. S., Frazzini, A., & Pedersen, L. H. (2019). Quality minus junk. *Review of Accounting Studies*, *24*(1), 34–112.

Asparouhova, E., Bessembinder, H., & Kalcheva, I. (2010). Liquidity biases in asset pricing tests. *Journal of Financial Economics*, *96*(2), 215–237.

Asparouhova, E., Bessembinder, H., & Kalcheva, I. (2013). Noisy prices and inferences regarding returns. *Journal of Finance*, *68*(2), 665–714.

Ben-David, I., Franzoni, F., Kim, B., & Moussawi, R. (2023). Competition for attention in the ETF space. *Review of Financial Studies*, *36*(3), 987–1042.

Bergstresser, D., Chalmers, J. M. R., & Tufano, P. (2009). Assessing the costs and benefits of brokers in the mutual fund industry. *Review of Financial Studies*, *22*(10), 4129–4156.

Berk, J. B., & van Binsbergen, J. H. (2015). Measuring skill in the mutual fund industry. *Journal of Financial Economics*, *118*(1), 1–20.

Bessembinder, H., Cooper, M. J., & Zhang, F. (2023). Mutual fund performance at long horizons. *Journal of Financial Economics*, *147*(1), 132–158.

Betermier, S., Schumacher, D., & Shahrad, A. (2023). Mutual fund proliferation and entry deterrence. *Review of Asset Pricing Studies*, *13*(4), 784–829.

Bhargava, S., Loewenstein, G., & Sydnor, J. (2017). Choose to lose: Health plan choices from a menu with dominated option. *Quarterly Journal of Economics*, *132*(3), 1319–1372.

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

Blume, M. E., & Stambaugh, R. F. (1983). Biases in computed returns: An application to the size effect. *Journal of Financial Economics*, *12*(3), 387–404.

Boguth, O., Carlson, M., Fisher, A., & Simutin, M. (2016). Horizon effects in average returns: The

role of slow information diffusion. *Review of Financial Studies*, *29*(8), 2241–2281.

Boldin, M., & Cici, G. (2010). The index fund rationality paradox. *Journal of Banking and Finance*, *34*(1), 33–43.

Bordalo, P., Gennaioli, N., & Shleifer, A. (2013). Salience and consumer choice. *Journal of Political Economy*, *121*(5), 803–843.

Bordalo, P., Gennaioli, N., & Shleifer, A. (2016). Competition for attention. *Review of Economic Studies*, *83*(2), 481–513.

Bordalo, P., Gennaioli, N., & Shleifer, A. (2020). Memory, attention, and choice. *Quarterly Journal of Economics*, *135*(3), 1399–1442.

Bordalo, P., Gennaioli, N., & Shleifer, A. (2022). Salience. *Annual Review of Economics*, *14*, 521–544.

Box, T., Davis, R., & Fuller, K. (2020). The dynamics of ETF fees. *Financial Analysts Journal*, *76*(1), 11–18.

Box, T., Davis, R. L., & Fuller, K. P. (2019). ETF competition and market quality. *Financial Management*, *48*(3), 873–916.

Broman, M. S. (2022). Naïve style-level feedback trading in passive funds. *Journal of Financial and Quantitative Analysis*, *57*(3), 1083–1114.

Brown, D. C., Davies, S. W., & Ringgenberg, M. C. (2021). ETF arbitrage, non-fundamental demand, and return predictability. *Review of Finance*, *25*(4), 937–972.

Brown, J. R., & Goolsbee, A. (2002). Does the Internet make markets more competitive? Evidence from the life insurance industry. *Journal of Political Economy*, *110*(3), 481–507.

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

Chetty, R., Looney, A., & Kroft, K. (2009). Salience and taxation: Theory and evidence. *American Economic Review*, *99*(4), 1145–1177.

Christofferson, S. E. K., & Musto, D. K. (2002). Demand curves and the pricing of money management. *Review of Financial Studies*, *15*(5), 1499–1524.

Clifford, C. P., Fulkerson, J. A., & Jordan, B. D. (2014). What drives ETF flows? *Financial Review*, *49*(3), 619–642.

Cooper, M., Halling, M., & Yang, W. (2021). The persistence of fee dispersion among mutual funds. *Review of Finance*, *25*(2), 365–402.

Dannhauser, C. D., & Pontiff, J. (2021). Flow. *Working Paper, Villanova University*.

deHaan, E., Song, Y., Xie, C., & Zhu, C. (2021). Obfuscation in mutual funds. *Journal of Accounting and Economics*, *72*(2-3), 101429.

Egan, M. (2019). Brokers versus retail investors: Conflicting interests and dominated products. *Journal of Finance*, *74*(3), 1217–1260.

Elton, E. J., Gruber, M. J., & Busse, J. A. (2004). Are investors rational? Choices among index funds. *Journal of Finance*, *59*(1), 261–288.

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of Financial Economics*, *116*(1), 1–22.

Finkelstein, A. (2009). *E-ZTax*: Tax salience and tax rates. *Quarterly Journal of Economics*, *124*(3), 969–1010.

Frazzini, A., & Pedersen, L. H. (2014). Betting against beta. *Journal of Financial Economics*, *111*(1), 1–25.

Green, R. C., Hollifield, B., & Schürhoff, N. (2007). Dealer intermediation and price behavior in the aftermarket for new bond issues. *Journal of Financial Economics*, *86*(3), 643–682.

Gurun, U. G., Matvos, G., & Seru, A. (2016). Advertising expensive mortgages. *Journal of Finance*, *71*(5), 2371–2416.

Hortaçsu, A., & Syverson, C. (2004). Product differentiation, search costs, and competition in the mutual fund industry: A case study of S&P 500 index funds. *Quarterly Journal of Economics*, *119*(2), 403–456.

Huang, S., Song, Y., & Xiang, H. (2023). The smart beta mirage. *Forthcoming in Journal of Financial and Quantitative Analysis*.

Khomyn, M., Putniņš, T. J., & Zoican, M. (2024). The value of ETF liquidity. *Forthcoming in Review of Financial Studies*.

Kim, H. H., & Yang, W. (2023). Simplified fee disclosure and attention to mutual fund fees. *Working Paper, University of South Carolina*.

Linnainmaa, J. T., Melzer, B. T., & Previtero, A. (2021). The misguided beliefs of financial advisors. *Journal of Finance*, *76*(2), 587–621.

Roussanov, N., Ruan, H., & Wei, Y. (2021). Marketing mutual funds. *Review of Financial Studies*, *34*(6), 3045–3094.

Sias, R., Turtle, H. J., & Zykaj, B. (2016). Hedge fund crowds and mispricing. *Management Science*, *62*(3), 764–784.

Figure 1: Fund Names for Mostly Dominated and Mostly Dominant ETFs.

Description: The figure displays word clouds for the names of ETFs that are dominated in most or all quarters (Panel A) or dominant over another fund in most or all quarters (Panel B).

Interpretation: Dominant ETF names are simple, formal descriptions. Dominated ETF names have more unique words with attempts at catchy names.

Panel A: Mostly or Always Dominated Fund Names

Panel B: Mostly or Always Dominant Fund Names

Figure 2: Average ETF Expense Ratio by Category.

Description: The figure plots the average quarterly expense ratio of ETFs in the Index, Sector Index, Quasi-Index, Active, Sector Active, and Smart Beta categories. The sample period is January 2000 to June 2018.

Interpretation: Average Index and Sector Index ETF fees have declined over time. Average fees have been relatively stable for more active categories.

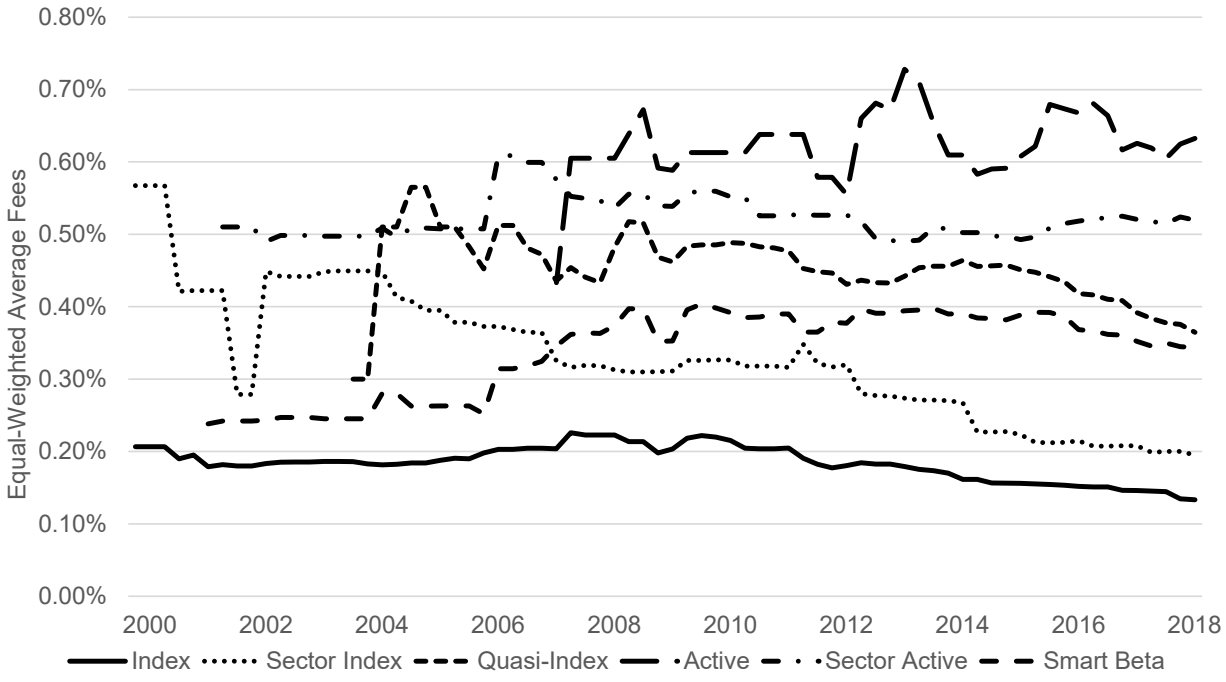
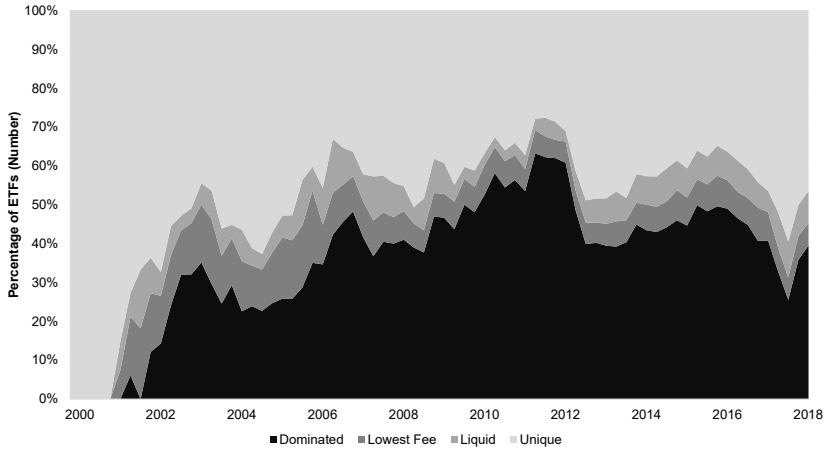


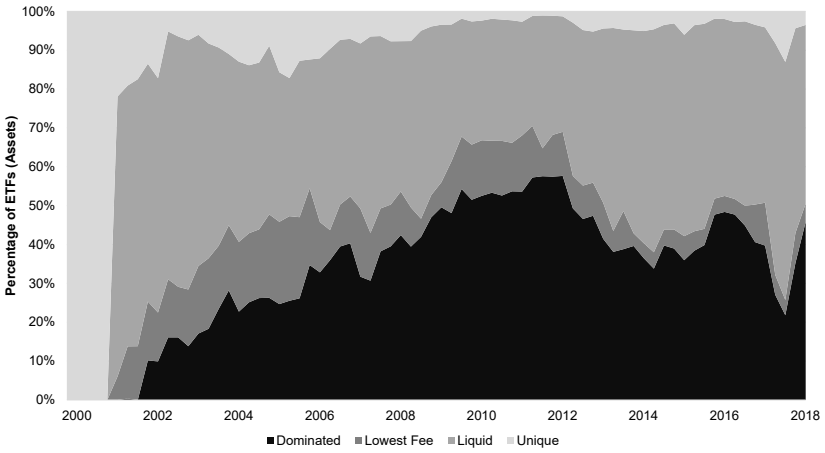
Figure 3: ETFs and Assets by Dominated and Non-Dominated ETF Types.

Description: The figure displays percentages associated with the number of ETFs (Panel A) and total market capitalization (Panel B) for four types of ETFs (dominated, lowest fee, liquid, and unique) over our sample period. Dominated ETFs are defined as those with a dominant ETF that exceeds the 95% return correlation threshold, has a weakly lower expense ratio, has a lower bid-ask spread, and has higher trading volume. Lowest fee ETFs have the lowest fee of all correlated ETFs. Liquid ETFs have higher liquidity than related ETFs that have lower fees. Unique ETFs have correlations strictly less than 95% with all other ETFs. The sample period is January 2000 to June 2018.

Interpretation: Significant capital is allocated to a large number of dominated ETFs. ETFs with high liquidity are relatively few in number, but manage about half of total ETF assets. Many small ETFs are not highly correlated with other ETFs.



Panel A: Percentage of ETF Types by Number

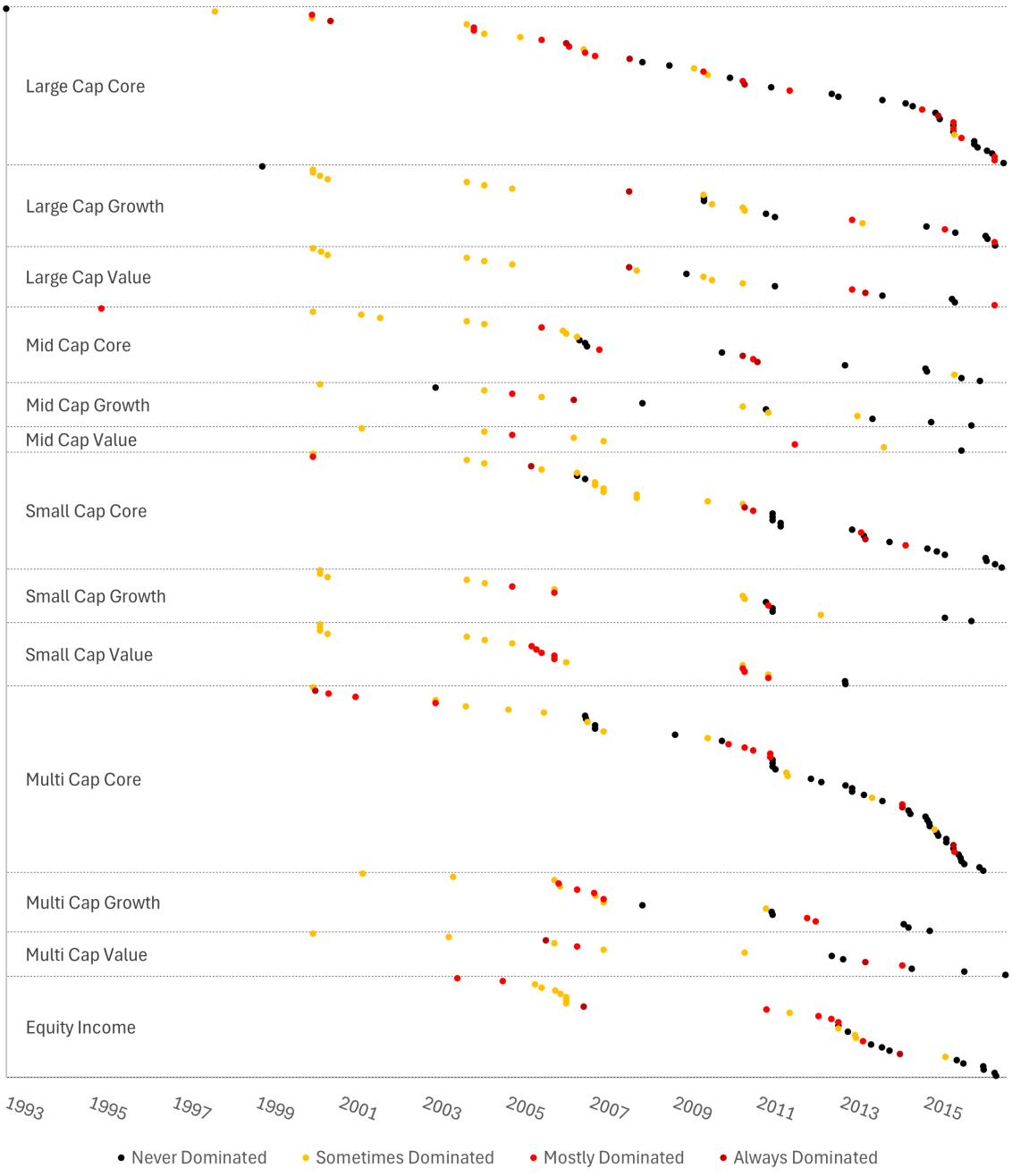


Panel B: Percentage of ETF Types by Assets

Figure 4: ETF Inception Timelines by Dominated Status.

Description: The figure displays inception dates by Lipper category for ETFs that are in the Never Dominated, Sometimes Dominated, Mostly Dominated, and Always Dominated categories.

Interpretation: ETF inceptions appear to depend on recent market performance and trends. Dominated ETF launches are often clustered in time and within category.



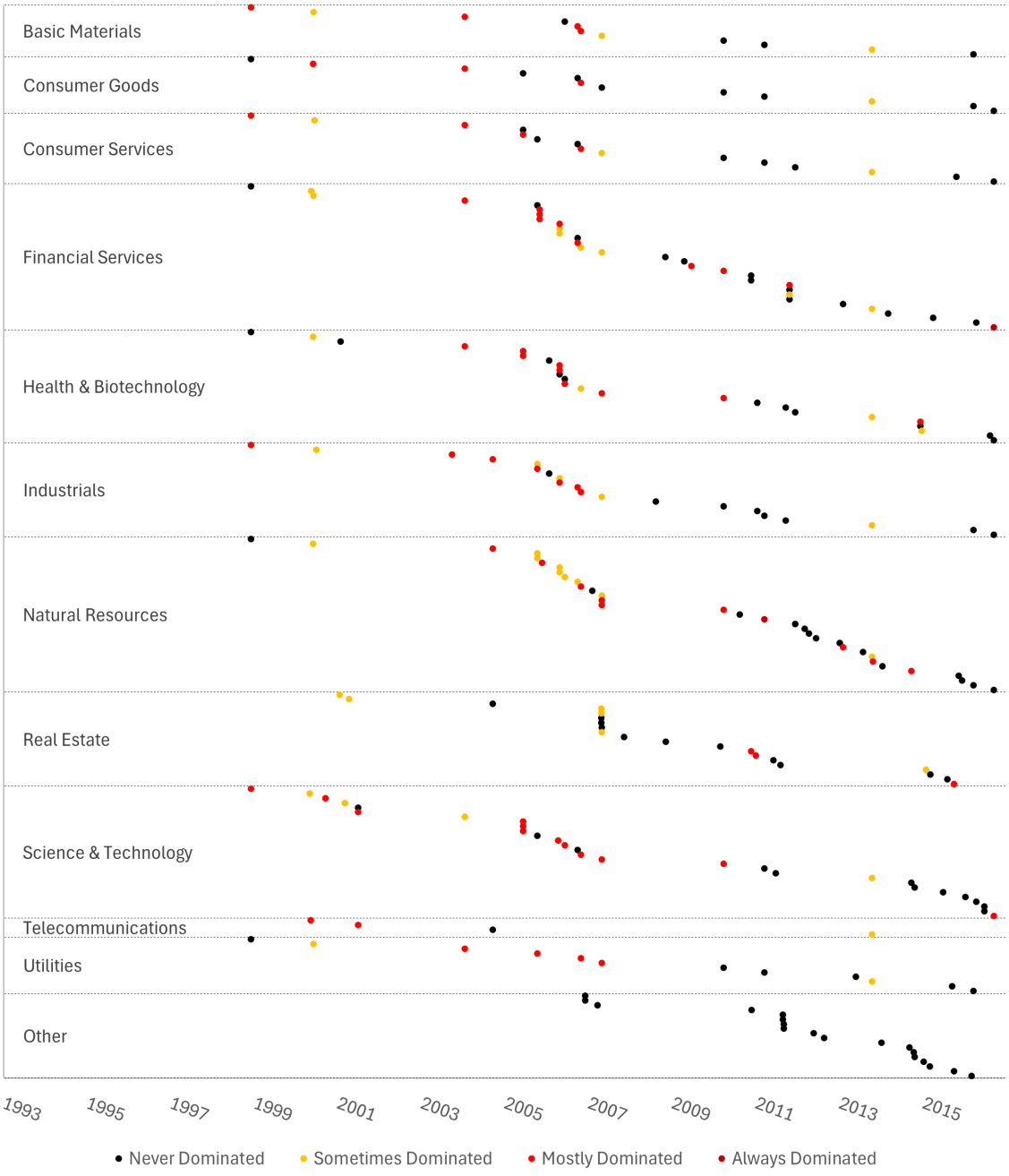
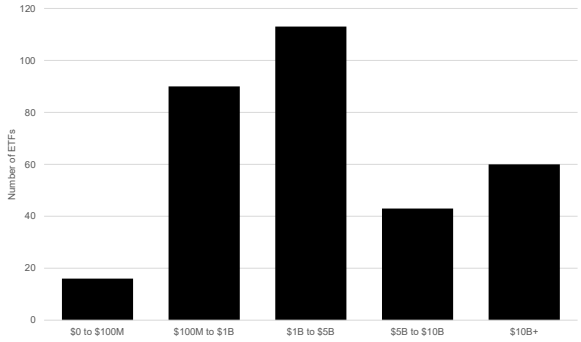

Basic Materials
Consumer Goods
Consumer Services
Financial Services
Health & Biotechnology
Industrials
Natural Resources
Real Estate
Science & Technology
Telecommunications
Utilities
Other
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
Never Dominated
Sometimes Dominated
Mostly Dominated
Always Dominated

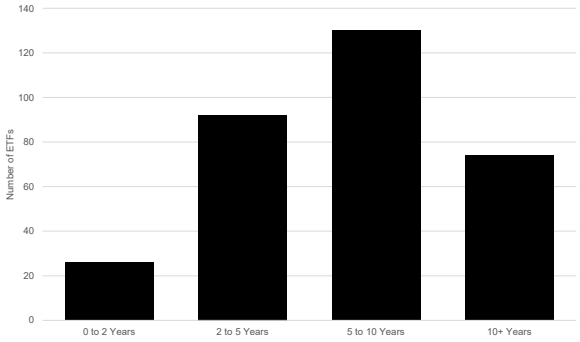
Figure 5: Dominant ETF Characteristics.

Description: The figure displays the distributions of dominant ETF size, age, and age difference with dominated ETFs. The figure considers the matching dominant ETF with the lowest fee in the first quarter in which each of the 322 dominated ETFs is dominated. The sample period is January 2000 to June 2018.

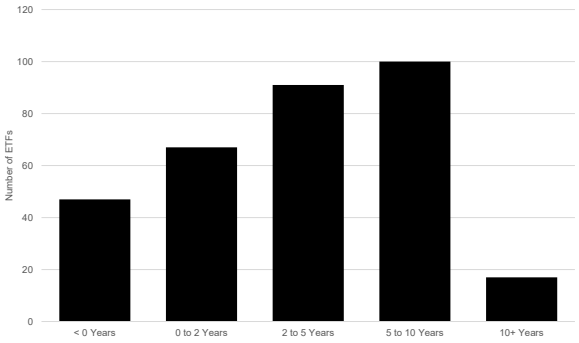
Interpretation: Dominated ETFs are almost always dominated by large, well-established funds rather than by new entrants.



Panel A: Distribution of Dominant ETF Sizes



Panel B: Distribution of Dominant ETF Ages



Panel C: Distribution of Dominant ETF Age Differences

Figure 6: Institutional Ownership of Dominated ETFs.

Description: The figure plots the average institutional ownership of dominated ETFs (solid line) and non-dominated ETFs (dotted line). Dominated ETFs are defined as those with a dominant ETF that exceeds the 95% return correlation threshold, has a weakly lower expense ratio, has a lower bid-ask spread, and has higher trading volume. The sample period is January 2000 to June 2018.

Interpretation: Retail and institutional investors have consistently made similar allocations to dominated ETFs over time. By the end of our sample, institutional ownership in dominated funds is actually higher than in non-dominated funds.

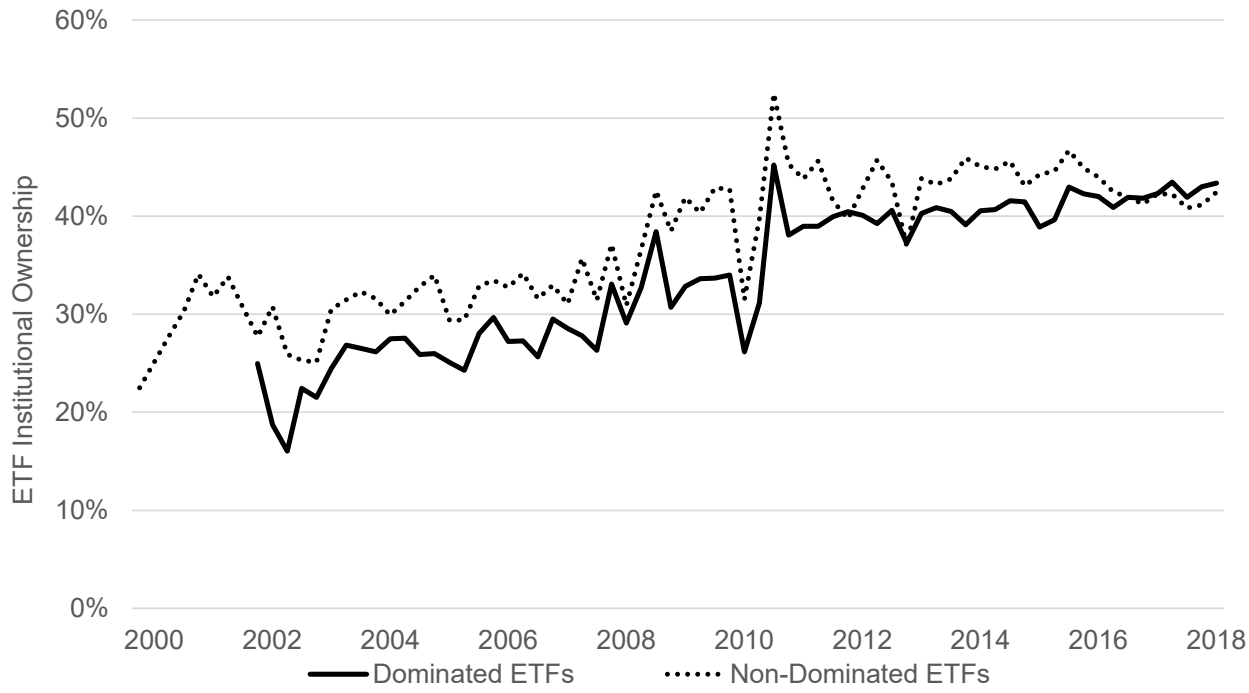


Figure 7: Total Fees by Dominated and Non-Dominated ETF Types.

Description: The figure plots the quarterly total fees charged by four types of ETFs (dominated, lowest fee, liquid, and unique). Dominated ETFs are defined as those with a dominant ETF that exceeds the 95% return correlation threshold, has a weakly lower expense ratio, has a lower bid-ask spread, and has higher trading volume. Lowest fee ETFs have the lowest fee of all correlated ETFs. Liquid ETFs have higher liquidity than related ETFs that have lower fees. Unique ETFs have correlations strictly less than 95% with all other ETFs. The sample period is January 2000 to June 2018.

Interpretation: Dominated ETFs account for a significant portion of total fees. The dominated and liquid fund types combine to charge more than 80% of total fees in our sample.

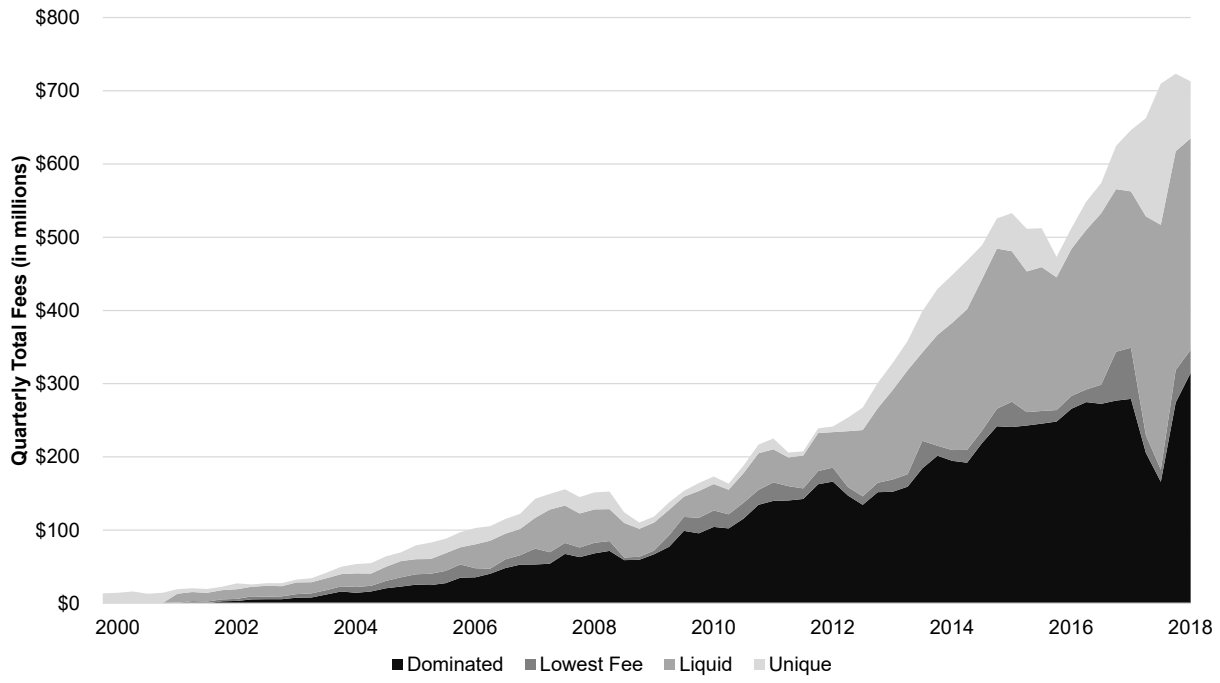


Figure 8: Aggregate Excess Costs of Dominated ETFs.

Description: The figure plots the quarterly excess costs of dominated ETFs broken down by excess fees (solid line) and excess trading costs (dashed line). Excess fees are calculated using the difference in quarterly expense ratios between the dominated and dominant ETF pairs multiplied by the dominated ETF's average market capitalization during the quarter. Excess trading costs are measured as one-half of the difference in bid-ask spreads multiplied by the dominated ETF's quarterly trading volume. The sample period is January 2000 to June 2018.

Interpretation: The average annual cost from investing in dominated ETFs is $255 million from higher fees and $105 million from higher trading costs, and these costs are increasing over time. While higher expense ratios drive the cost of dominated ETFs in normal times, trading costs loom large in volatile markets.

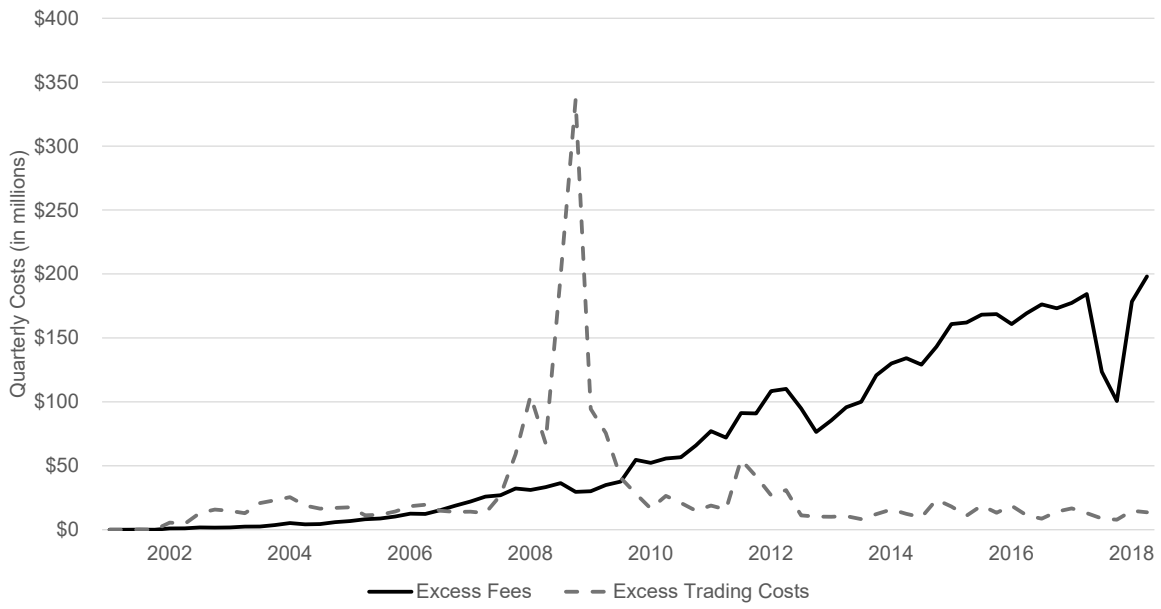
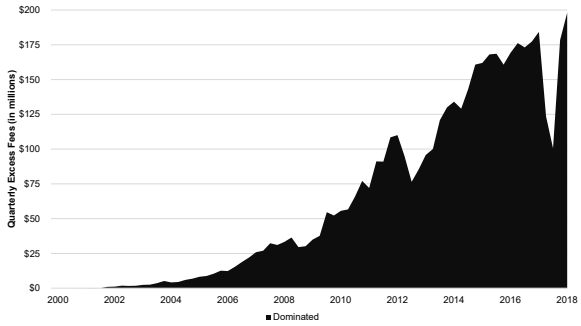


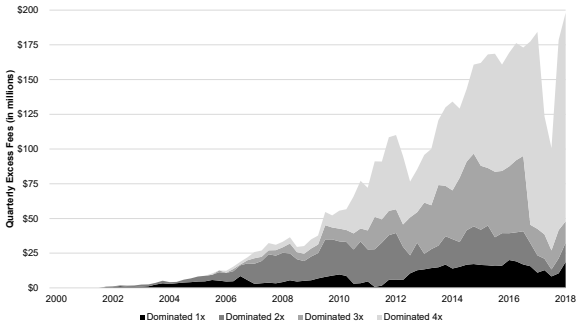
Figure 9: Excess Fees by Dominated ETF Groups.

Description: The figure plots the quarterly excess fees of dominated ETFs by group. Panel A reproduces the total excess fees for all dominated ETFs. Panel B groups dominated ETFs based on the ratio of their expense ratio to the expense ratio of the cheapest dominant ETF. Panel C groups on the frequency of fund domination. Panel D groups on the initial timing of domination. Panel E groups on early and late entrants. Panel F groups on whether the dominated ETFs are dominated by a fund in the same family. The sample period is January 2000 to June 2018.

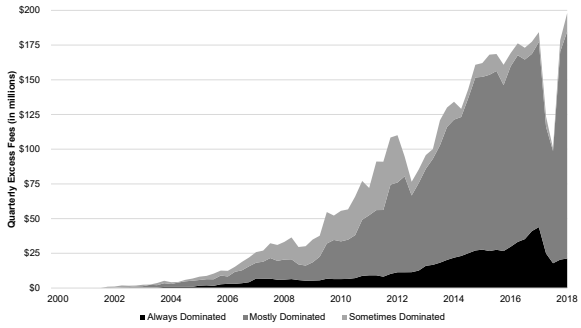
Interpretation: Large portions of excess fees are charged by dominated ETFs with exorbitant fees, funds that are persistently dominated almost immediately upon inception, late movers, and funds that are dominated within family.



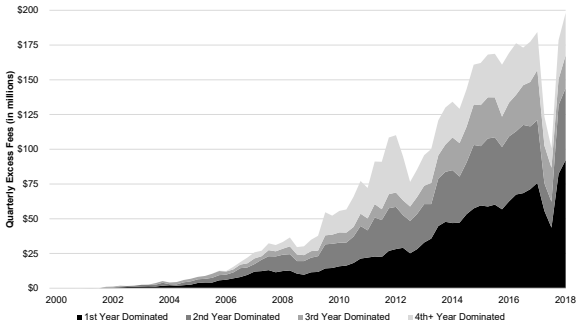
Panel A: Dominated ETFs



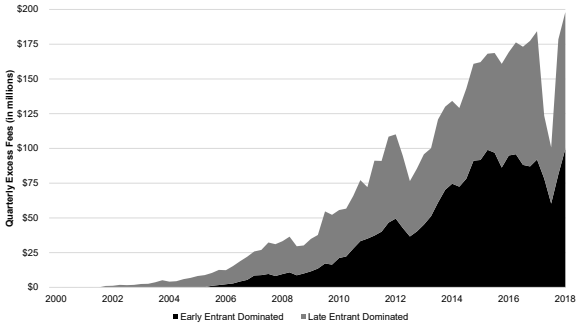
Panel B: Degree of Domination



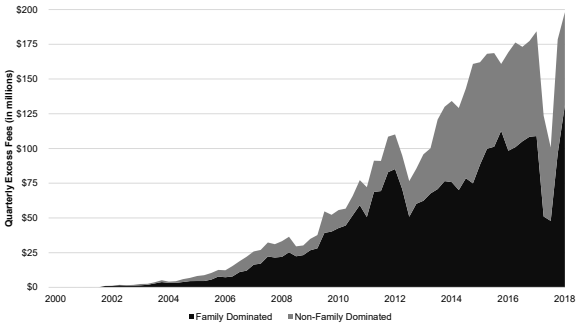
Panel C: Dominated Frequency



Panel D: Dominated Timing



Panel E: Early vs Late Entrant



Panel F: Fund Family

Table 1: Annual ETF Sample.

Description: The table reports the number and aggregate market capitalization of ETFs in our sample. ETF classifications are based on Lipper codes and fund descriptions on ETF.com and ETFDB.com. Number and Market Cap are measured at the end of each calendar year, except for 2018 which is measured at the end of June. Market Cap is reported in millions.

Interpretation: The ETF market originated with a small set of Index and Sector Index ETFs. The substantial assets drawn by these ETFs invited competition from new fund sponsors and additional listings from early sponsors, and the Index and Sector Index categories quickly grew in the early years of the ETF market. In recent years, large numbers of Quasi-Index, Active, Sector Active, and Smart Beta ETFs have been listed, whereas the set of Index ETFs has been relatively stable.

	Index ETFs		Sector Index ETFs		Quasi-Index ETFs		Active ETFs		Sector Active ETFs		Smart Beta ETFs	
Year	Number	Market Cap	Number	Market Cap	Number	Market Cap	Number	Market Cap	Number	Market Cap	Number	Market Cap
2000	3	$29,988	7	$2,259	0	$0	0	$0	0	$0	0	$0
2001	10	$46,742	8	$3,403	0	$0	0	$0	1	$66	14	$4,172
2002	11	$56,407	19	$4,572	0	$0	0	$0	7	$830	16	$6,965
2003	12	$76,126	20	$8,433	2	$331	0	$0	7	$1,938	16	$13,366
2004	17	$106,196	26	$13,856	2	$732	0	$0	8	$3,800	22	$25,248
2005	22	$117,744	30	$20,223	4	$9,416	0	$0	8	$4,703	30	$33,077
2006	25	$132,550	31	$27,793	10	$11,978	0	$0	26	$7,207	44	$54,270
2007	28	$201,121	32	$40,711	21	$12,006	6	$386	59	$13,135	54	$73,995
2008	30	$188,103	32	$33,579	28	$8,723	10	$230	75	$11,007	69	$55,798
2009	30	$207,749	34	$48,755	31	$12,316	10	$449	81	$14,651	71	$65,789
2010	33	$235,522	34	$63,366	36	$24,781	11	$688	92	$20,353	75	$81,228
2011	43	$238,173	42	$70,072	42	$39,066	8	$802	94	$20,091	86	$83,768
2012	41	$322,893	36	$87,005	49	$50,977	9	$1,201	111	$31,234	100	$106,794
2013	41	$485,034	36	$132,029	43	$81,797	15	$2,901	109	$50,596	108	$159,525
2014	40	$581,881	46	$174,973	52	$103,160	18	$4,216	114	$68,898	119	$213,995
2015	40	$586,250	45	$170,901	57	$97,406	29	$4,025	120	$74,696	129	$242,534
2016	40	$739,591	47	$204,579	66	$127,953	29	$5,484	128	$76,197	150	$311,834
2017	40	$979,235	47	$251,023	71	$155,043	33	$8,689	143	$98,027	152	$405,598
2018	39	$1,020,377	46	$251,683	61	$136,924	27	$9,104	131	$100,772	144	$427,979

Table 2: Sample Summary Statistics.

Description: The table reports overall summary statistics for ETFs in our sample split by Index, Sector Index, Quasi-Index, Active, Sector Active, and Smart Beta ETFs. All variables are defined in Table A1. The sample period is January 2000 to June 2018. Market Cap and Institutional Market Cap are reported in millions.

Interpretation: Index and Sector Index ETFs are larger, cheaper, and more liquid than their Active and Sector Active counterparts. Quasi-Index and Smart Beta ETFs tend to fall between those groups in size, fees, and liquidity.

	Index	Sector Index	Quasi-Index	Active	Sector Active	Smart Beta
Number of ETFs	46	55	92	49	155	170
Number of Observations	2,043	2,312	2,057	683	4,722	5,046
Market Cap	$10,282	$2,378	$1,433	$174	$429	$1,553
Institutional Market Cap	$5,855	$1,449	$477	$72	$233	$738
Flow	7.48%	6.95%	6.62%	7.41%	10.98%	8.35%
Expense Ratio	0.18	0.30	0.44	0.63	0.52	0.36
Bid-Ask Spread	0.10	0.16	0.22	0.45	0.18	0.18
Trading Turnover	2.21	2.38	0.53	0.59	1.54	0.67
Turnover Ratio	0.15	0.10	0.50	1.53	0.47	0.56
Quarter Return	2.63	2.39	2.62	2.38	2.70	2.68
Alpha	−0.04	−0.03	−0.03	−0.05	−0.00	−0.01
Uniqueness	0.08	0.05	0.15	0.25	0.26	0.15
ETF Age	8.40	8.69	5.65	3.72	6.10	6.48
Search Volume	639,981	169,213	302,295	241,189	742,496	283,556
Sponsor Tilt	0.09	0.08	0.03	0.05	0.04	0.07
Dominated	0.59	0.39	0.49	0.19	0.23	0.59

Table 3: Dominated ETF Characteristics.

Description: The table displays information on characteristics of dominated and dominant ETFs. Panel A shows the numbers of dominated and dominant ETFs and the distributions of observations across ETF categories. Panel B displays sample means of ETF characteristics for dominated and dominant ETFs and the differences between the sample means, and Panel C shows sample means of compounded annual returns gross and net of expenses. The samples include quarterly observations for dominated ETFs and the paired dominant ETF. All variables are defined in Table A1, and ***, **, and * indicate statistical significance of differences in sample means at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018. Market Cap and Institutional Market Cap are reported in millions.

Interpretation: Throughout our sample, 322 out of 567 ETFs have been dominated in at least one quarter by 164 dominant ETFs. Dominant ETFs tend to be Index and dominated ETFs tend to be Smart Beta. There is no evidence that dominated ETFs outperform dominant ETFs.

	Dominated	Dominant	Difference
Panel A: Dominated and Dominant ETFs by Category			
Distinct ETFs	322	164	
Observations	7,327	7,327	
Index	16%	62%	-46%***
Sector Index	12%	18%	-5%***
Quasi-Index	14%	4%	9%***
Active	2%	0%	2%***
Sector Active	15%	5%	10%***
Smart Beta	41%	11%	30%***
Panel B: Dominated and Dominant ETF Characteristics			
Market Cap	$2,157	$13,749	$-11,592***
Institutional Market Cap	$954	$6,396	$-5,442***
Flow	6.27%	2.84%	3.43%***
Expense Ratio	0.34	0.12	0.22***
Bid-Ask Spread	0.10	0.04	0.06***
Trading Turnover	0.90	2.46	-1.56***
Turnover Ratio	0.33	0.12	0.21***
Alpha	-0.09	-0.02	-0.07**
Uniqueness	0.06	0.03	0.03***
ETF Age	7.77	9.00	-1.24***
Log Search Volume	9.89	11.21	-1.32***
Sponsor Tilt	0.07	0.18	-0.10***
Panel C: Dominated and Dominant ETF Performance			
Net Annual Return	10.72	10.91	-0.18
Gross Annual Return	11.07	11.02	0.04

Table 4: ETF Size Determinants.

Description: The table displays quarterly panel regressions of Log Market Cap on ETF characteristics. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. All variables are defined in Table A1. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Dominated ETFs in the relatively straightforward Index and Sector Index categories are smaller than expected. Dominated ETFs in the Quasi-Index, Active, Sector Active, and Smart Beta categories are larger than would be expected given other fund characteristics. Investors are more capable of identifying dominated products when fees are more salient than strategies.

	Log Market Cap					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Dominated	-0.30***	-0.14**	0.51***	1.20***	0.28***	0.81***
	(-3.50)	(-2.01)	(5.37)	(9.53)	(4.71)	(10.67)
Expense Ratio	-3.19***	-3.10***	-2.27***	0.30*	-0.06	-1.84***
	(-8.90)	(-7.86)	(-19.54)	(1.71)	(-0.36)	(-12.94)
Bid-Ask Spread	-2.32**	-0.65**	-0.27**	-0.04	-4.03***	-0.67***
	(-2.50)	(-2.19)	(-2.47)	(-1.29)	(-6.69)	(-4.56)
Trading Turnover	0.08***	0.03***	-0.03	-0.04***	0.10***	0.08***
	(6.42)	(7.41)	(-0.65)	(-3.91)	(6.77)	(3.45)
Turnover Ratio	-0.26	-2.17***	-0.07***	0.03***	-0.33***	-0.20***
	(-1.16)	(-10.67)	(-4.22)	(6.32)	(-7.11)	(-4.39)
Quarter Return	0.01	0.01***	-0.01	-0.01	0.01***	-0.01
	(0.98)	(4.03)	(-0.49)	(-0.98)	(3.49)	(-0.48)
Alpha	-0.74**	-0.29	0.57**	0.24	0.21**	-0.01
	(-2.28)	(-1.15)	(2.39)	(1.30)	(2.48)	(-1.07)
Uniqueness	-7.05***	-2.67***	-4.32***	-4.69***	0.35**	-2.53***
	(-9.14)	(-4.13)	(-16.54)	(-13.87)	(2.23)	(-10.19)
Log ETF Age	2.41***	2.00***	1.57***	1.06***	1.06***	1.13***
	(33.03)	(24.88)	(23.12)	(9.52)	(15.62)	(23.02)
Log Search Volume	0.07***	0.00	0.11***	-0.00	0.01***	0.08***
	(5.59)	(0.39)	(8.76)	(-0.63)	(2.75)	(18.61)
Sponsor Tilt	2.26***	1.03***	0.75***	1.62***	1.92***	2.79***
	(8.31)	(2.68)	(3.47)	(4.59)	(10.66)	(11.17)
Observations	2,043	2,312	2,057	683	4,719	5,046
Adjusted R^2	0.765	0.750	0.675	0.584	0.500	0.692
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: ETF Institutional Allocation Determinants.

Description: The table displays quarterly panel regressions of Log Institutional Market Cap on ETF characteristics. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. All variables are defined in Table A1. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Allocations by institutions generally mirror the total allocations of all ETF investors. Dominated ETFs in the Quasi-Index, Active, Sector Active, and Smart Beta categories manage more institutional capital than would be expected given other fund characteristics.

	Log Inst Market Cap					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Dominated	-0.46***	-0.16*	0.67***	1.06***	0.19**	0.86***
	(-3.78)	(-1.73)	(6.30)	(5.09)	(2.54)	(9.90)
Expense Ratio	-2.20***	-3.52***	-1.57***	0.85	-0.65*	-1.37***
	(-4.57)	(-6.44)	(-6.40)	(1.46)	(-1.90)	(-8.92)
Bid-Ask Spread	-4.13***	-0.98	-0.04	-0.06	-4.49***	-0.86***
	(-3.04)	(-1.66)	(-0.29)	(-1.19)	(-5.92)	(-4.42)
Trading Turnover	0.11***	0.06***	-0.00	0.01	0.15***	0.07**
	(7.12)	(5.71)	(-0.01)	(0.62)	(10.92)	(2.33)
Turnover Ratio	0.37	-1.92***	-0.09**	-0.06	-0.27***	-0.24***
	(1.35)	(-6.64)	(-2.25)	(-1.45)	(-4.89)	(-3.52)
Quarter Return	-0.00	0.02***	0.00	-0.03	0.01***	-0.01
	(-0.21)	(3.32)	(0.03)	(-1.37)	(3.32)	(-0.51)
Alpha	0.03	0.12	0.30	-0.18	0.33***	-0.01
	(0.04)	(0.17)	(0.99)	(-0.42)	(2.87)	(-1.01)
Uniqueness	-7.99***	-2.63**	-5.67***	-5.76***	0.55	-2.97***
	(-8.00)	(-2.56)	(-9.60)	(-4.18)	(1.26)	(-8.95)
Log ETF Age	2.72***	2.68***	1.56***	1.04**	1.17***	1.05***
	(22.74)	(15.90)	(13.41)	(2.31)	(13.56)	(15.67)
Log Search Volume	0.10***	-0.01	0.10***	-0.04	0.02	0.09***
	(5.59)	(-0.88)	(5.88)	(-1.58)	(1.37)	(17.83)
Sponsor Tilt	3.07***	1.09**	2.45***	4.08***	3.87***	4.58***
	(7.05)	(2.40)	(6.18)	(8.77)	(10.25)	(16.08)
Observations	2,043	2,312	2,057	683	4,719	5,046
Adjusted R^2	0.701	0.637	0.453	0.330	0.398	0.562
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: ETF Flow Determinants.

Description: The table displays quarterly panel regressions of Flow on ETF characteristics. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. All variables are defined in Table A1. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: There is suggestive evidence that dominated index funds receive lower flow, whereas the results for the other categories are mixed. All estimates for the dominated indicator variable are small in magnitude relative to the positive average flow in each category, such that investors do not appear to sufficiently punish dominated ETFs.

	Flow					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Dominated	-0.02	-0.03**	-0.00	0.02	0.02	-0.03**
	(-0.82)	(-2.22)	(-0.14)	(0.48)	(0.77)	(-2.10)
Expense Ratio	-0.29***	-0.10*	-0.17	-0.08	0.13*	-0.09*
	(-4.22)	(-1.99)	(-1.30)	(-1.66)	(1.97)	(-1.72)
Bid-Ask Spread	-0.10	0.13**	-0.02	-0.00	-0.27***	-0.04
	(-0.77)	(2.25)	(-1.06)	(-0.34)	(-2.67)	(-1.10)
Trading Turnover	0.00**	0.01***	0.12*	0.01	0.04***	0.07***
	(2.36)	(3.73)	(1.73)	(0.44)	(3.76)	(4.55)
Turnover Ratio	0.23	0.08	0.00	0.00	-0.02	-0.01
	(0.81)	(0.65)	(0.06)	(0.38)	(-1.01)	(-0.51)
Quarter Return	0.02**	0.01***	0.01***	0.01***	0.01***	0.01***
	(2.43)	(5.34)	(3.34)	(3.05)	(6.99)	(3.99)
Alpha	-0.08	-0.06	0.05	0.17**	0.09**	0.00***
	(-0.51)	(-0.89)	(0.56)	(2.41)	(2.06)	(2.74)
Uniqueness	0.12	-0.47***	0.12	-0.02	0.11	-0.21**
	(0.34)	(-4.18)	(1.22)	(-0.11)	(1.13)	(-2.15)
Log ETF Age	-0.06*	-0.02	-0.05**	-0.10***	-0.05*	-0.08***
	(-1.89)	(-1.27)	(-2.49)	(-2.97)	(-1.80)	(-6.81)
Log Search Volume	-0.00	0.00	0.00	0.01*	0.00	0.00
	(-0.25)	(1.31)	(1.17)	(1.74)	(0.67)	(1.14)
Sponsor Tilt	0.11	-0.12	-0.11	0.02	0.89**	0.17**
	(1.23)	(-1.53)	(-0.46)	(0.29)	(2.48)	(2.28)
Lag Market Cap	-0.02	-0.04***	-0.00	-0.01	-0.08***	-0.03***
	(-1.11)	(-4.83)	(-0.77)	(-0.88)	(-4.90)	(-4.43)
Observations	1,997	2,257	1,965	634	4,564	4,876
Adjusted R^2	0.056	0.192	0.057	0.068	0.120	0.088
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: Dominated ETF Group Proportions.

Description: The table reports the proportions of dominated ETF observations across each of five sets of non-overlapping groups for Index, Sector Index, Quasi-Index, Active, Sector Active, and Smart Beta ETFs. All variables are defined in Table A1. The sample period is January 2000 to June 2018.

Interpretation: Most dominated ETFs have very high fees, are dominated for most of their lives, and are quickly dominated after inception.

	Index	Sector Index	Quasi-Index	Active	Sector Active	Smart Beta
Dominated 1x	38.7%	32.6%	16.4%	3.9%	37.3%	23.2%
Dominated 2x	33.8%	39.2%	10.4%	2.4%	18.1%	21.4%
Dominated 3x	16.3%	12.2%	14.0%	10.2%	19.3%	17.3%
Dominated 4x	11.2%	16.1%	59.1%	83.5%	25.3%	38.0%
Always Dominated	30.4%	16.3%	16.4%	35.4%	4.5%	16.3%
Mostly Dominated	48.5%	57.8%	62.3%	48.0%	52.6%	61.0%
Sometimes Dominated	21.1%	25.9%	21.3%	16.5%	43.0%	22.7%
1st Year Dominated	51.3%	45.8%	66.3%	83.5%	37.1%	31.5%
2nd Year Dominated	19.7%	20.9%	3.2%	10.2%	18.7%	35.8%
3rd Year Dominated	16.2%	18.8%	12.3%	0.0%	23.8%	11.4%
4th+ Year Dominated	12.8%	14.6%	18.2%	6.3%	20.3%	21.3%
Early Entrant Dominated	39.6%	55.5%	10.0%	0.0%	14.9%	33.2%
Late Entrant Dominated	60.4%	44.5%	90.0%	100.0%	85.1%	66.8%
Family Dominated	82.7%	23.9%	40.8%	55.9%	20.4%	68.7%
Non-Family Dominated	17.3%	76.1%	59.2%	44.1%	79.6%	31.3%

Table 8: Dominated ETF Size by Group.

Description: The table displays quarterly panel regressions of Log ETF Market Cap on ETF characteristics and indicators for each of five sets of non-overlapping groups. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. Controls are Expense Ratio, Bid-Ask Spread, Trading Turnover, Turnover Ratio, Quarter Return, Alpha, Uniqueness, Log ETF Age, Log Search Volume, and Sponsor Tilt. All variables are defined in Table A1. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: The excess assets of dominated ETFs are not confined to funds with similar expense ratios as their dominant counterparts, ETFs that are infrequently dominated, or early entrants into the ETF market. ETFs with exorbitant fees and that were dominated throughout their lives attract substantial excess assets.

	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Panel A: Degree of Domination						
Dominated 1x	0.11	0.15*	0.85***	0.91**	0.17***	1.02***
	(1.13)	(1.86)	(5.12)	(2.08)	(2.83)	(12.31)
Dominated 2x	-0.51***	-0.19**	0.63***	0.65***	0.39***	0.65***
	(-5.84)	(-2.00)	(4.36)	(3.25)	(7.31)	(7.28)
Dominated 3x	-0.87***	-0.74***	0.50***	0.78***	0.13	0.67***
	(-11.56)	(-8.61)	(3.73)	(5.04)	(1.37)	(6.20)
Dominated 4x	-1.18***	-0.66***	0.39***	1.28***	0.54***	0.81***
	(-9.62)	(-7.27)	(4.07)	(10.02)	(5.97)	(9.97)
Panel B: Dominated Frequency						
Always Dominated	-0.12	0.53***	1.04***	1.61***	0.48***	1.38***
	(-0.92)	(3.69)	(10.33)	(7.81)	(3.93)	(17.40)
Mostly Dominated	-0.42***	-0.35***	0.41***	1.20***	0.27***	0.93***
	(-5.86)	(-4.02)	(4.56)	(8.45)	(4.27)	(11.41)
Sometimes Dominated	-0.24**	-0.18**	0.35**	0.37**	0.27***	0.34***
	(-2.48)	(-2.49)	(2.49)	(2.50)	(3.33)	(4.36)
Panel C: Dominated Timing						
1st Year Dominated	-0.25***	-0.04	0.44***	1.37***	0.24***	1.01***
	(-2.77)	(-0.49)	(4.60)	(9.35)	(5.26)	(15.07)
2nd Year Dominated	-0.24**	-0.07	0.07	0.64***	0.64***	1.04***
	(-2.40)	(-0.87)	(1.04)	(5.48)	(5.43)	(10.85)
3rd Year Dominated	-0.58***	-0.54***	0.68***		0.12**	0.55***
	(-7.54)	(-6.41)	(5.42)		(2.09)	(7.03)
4th+ Year Dominated	-0.07	-0.17**	0.81***	-0.10	0.20***	0.20**
	(-0.60)	(-2.30)	(5.79)	(-0.64)	(2.73)	(2.14)
Panel D: Early vs Late Entrant						
Early Entrant Dominated	-0.18**	-0.21**	0.66***		0.39***	1.39***
	(-2.61)	(-2.09)	(4.80)		(5.47)	(14.25)
Late Entrant Dominated	-0.41***	-0.06	0.50***	1.20***	0.27***	0.67***
	(-3.79)	(-0.87)	(5.22)	(9.53)	(4.28)	(8.83)
Panel E: Fund Family						
Family Dominated	-0.38***	-0.35***	0.72***	1.19***	0.10**	0.86***
	(-4.28)	(-5.61)	(7.05)	(7.29)	(2.11)	(10.69)
Non-Family Dominated	0.00	-0.09	0.40***	1.20***	0.33***	0.75***
	(0.01)	(-1.17)	(4.21)	(8.94)	(4.80)	(9.61)
Observations	2,043	2,312	2,057	683	4,719	5,046
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: Dominated ETF Excess Fees.

Description: The table displays the excess fees of investors using dominated ETFs relative to using the dominant counterparts. The first column shows the average annual excess fees during the sample period, the second column shows the annualized excess fees for the second quarter of 2018, and the last column shows the total excess fees over our sample period of January 2000 to June 2018. Excess fees are calculated using the difference in quarterly expense ratios between the dominated and dominant ETF pairs multiplied by the dominated ETF's average market capitalization during the quarter. Costs are reported in millions.

Interpretation: Excess fees are large and increasing over time. Aggregate excess fees from January 2000 to June 2018 are $4.7 billion. The excess fees of dominated ETFs are not confined to funds with similar expense ratios as their dominant counterparts, ETFs that are infrequently dominated, or early entrants into the ETF market. ETFs with exorbitant fees and that were dominated early in their lives charge substantial excess fees.

	Average Annual Excess Fees	Annualized Excess Fees for Q2 2018	Total Excess Fees
Panel A: All Dominated ETFs			
All Dominated ETFs	$255	$792	$4,715
Panel B: Degree of Domination			
Dominated 1x	$28	$75	$524
Dominated 2x	$53	$56	$985
Dominated 3x	$56	$62	$1,028
Dominated 4x	$118	$600	$2,177
Panel C: Dominated Frequency			
Always Dominated	$41	$85	$758
Mostly Dominated	$176	$654	$3,248
Sometimes Dominated	$38	$53	$709
Panel D: Dominated Timing			
1st Year Dominated	$92	$369	$1,708
2nd Year Dominated	$70	$207	$1,296
3rd Year Dominated	$39	$94	$714
4th+ Year Dominated	$54	$122	$997
Panel E: Early vs Late Entrant			
Early Entrant Dominated	$132	$394	$2,437
Late Entrant Dominated	$123	$399	$2,278
Panel F: Fund Family			
Family Dominated	$160	$525	$2,958
Non-Family Dominated	$95	$267	$1,757

A Appendix

Table A1: Variable Definitions.

This table contains the definitions and descriptions of the variables used in the paper.

Variable	Definition
Market Cap	Share price times shares outstanding at quarter end (Sources: Bloomberg and CRSP).
Institutional Ownership	Quarterly institutional ownership for ETFs as a percentage of available shares. Available shares are shares outstanding plus short interest (Sources: Thomson Reuters 13F and Compustat).
Institutional Market Cap	Quarterly institutional ownership for ETFs as a percentage of available shares multiplied by quarter-end market cap. (Sources: Thomson Reuters 13F, Compustat, Bloomberg, and CRSP).
Flow	The quarterly ETF dollar flow as a percentage of beginning-of-quarter total net assets following Dannhauser and Pontiff (2021) (Sources: Bloomberg and CRSP).
Dominated	Indicator equal to one if the ETF has at least a 95% correlation in daily returns over the last year with another ETF that has a weakly lower expense ratio, lower bid-ask spread, and higher trading volume (Sources: Bloomberg and CRSP).
Dominated Fee Gap	The difference in expense ratios, measured in basis points per year, for each dominated ETF relative to its dominant ETF.
Expense Ratio	The annual expense ratio (Source: CRSP).
Bid-Ask Spread	The mean of the daily bid-ask spread as a percentage of NAV (Source: CRSP).
Trading Turnover	The mean of the daily trading volume in the ETF divided by shares outstanding (Source: Bloomberg).
Turnover Ratio	The annual turnover ratio for the ETF portfolio (Source: CRSP).
Quarter Return	The ETF return for the quarter (Sources: Bloomberg and CRSP).
Alpha	Alpha from the benchmark regression described in Section 2.2 multiplied by 252 (Sources: CRSP, Kenneth French, and AQR).
Uniqueness	$(1 - R^2)$ from the benchmark regression described in Section 2.2 (Sources: CRSP, Kenneth French, and AQR).
ETF Age	Number of years since fund inception (Source: Bloomberg).
Search Volume	Average monthly Google Keyword Planner search volume (Source: keywordseverywhere.com).
Sponsor Tilt	The target-ETF-share-weighted average of the abnormal sponsor holdings of the 13F institutions that own an ETF. Abnormal sponsor holdings are calculated by subtracting the 13F market share of each sponsor from the sponsor's portfolio weights in each 13F institution excluding the target ETF (Source: Thomson Reuters 13F).
Lag Market Cap	The lag of the log of Market Cap (Sources: Bloomberg and CRSP).
Dominated 1x	Indicator equal to one if the ETF is dominated in the current quarter and its expense ratio is at least as high and no more than twice as high as its dominant ETF's expense ratio (Sources: Bloomberg and CRSP).
Dominated 2x	Indicator equal to one if the ETF is dominated in the current quarter and its expense ratio is more than twice as high and no more than three times as high as its dominant ETF's expense ratio (Sources: Bloomberg and CRSP).
Dominated 3x	Indicator equal to one if the ETF is dominated in the current quarter and its expense ratio is more than three times as high and no more than four times as high as its dominant ETF's expense ratio (Sources: Bloomberg and CRSP).
Dominated 4x	Indicator equal to one if the ETF is dominated in the current quarter and its expense ratio is more than four times as high as its dominant ETF's expense ratio (Sources: Bloomberg and CRSP).
Always Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it has always been dominated to date in our sample (Sources: Bloomberg and CRSP).

Table A1: continued from previous page

Variable	Definition
Mostly Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it has been dominated in at least 50%, but not all, of the quarters to date in our sample. (Sources: Bloomberg and CRSP).
Sometimes Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it has been dominated in less than 50% of the quarters to date in our sample. (Sources: Bloomberg and CRSP).
1st Year Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it was dominated within the first year of appearing in our sample. (Sources: Bloomberg and CRSP).
2nd Year Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it was first dominated in the second year of appearing in our sample. (Sources: Bloomberg and CRSP).
3rd Year Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it was first dominated in the third year of appearing in our sample. (Sources: Bloomberg and CRSP).
4th+ Year Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it was first dominated after the third year of appearing in our sample. (Sources: Bloomberg and CRSP).
Early Entrant Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it was one of the first two ETFs in its Lipper class or it originated in the first two years of its Lipper class (Sources: Bloomberg and CRSP).
Late Entrant Dominated	Indicator equal to one if the ETF is dominated in the current quarter and it does not qualify as an early entrant (Sources: Bloomberg and CRSP).
Family Dominated	Indicator equal to one if the ETF is dominated by another ETF from the same fund sponsor in the current quarter. (Sources: Bloomberg and CRSP).
Non-Family Dominated	Indicator equal to one if the ETF is dominated and is not dominated by another ETF from the same fund sponsor in the current quarter. (Sources: Bloomberg and CRSP).
Family Size	Sum of market cap at quarter end for all ETFs that share a fund sponsor excluding the target ETF (Sources: Bloomberg and CRSP).
In-Kind Creation	Indicator equal to one if the ETF allows in-kind creation and redemption (Source: Bloomberg).
ESG	Indicator equal to one if the ETF claims to focus on environmental, social, and governance issues (Sources: ETF.com and ETFDB.com).

B Internet Appendix for "Dominated ETFs"

Table B1: Sector and Smart Beta Summary Statistics.

Description: The table reports summary statistics for Sector and Smart Beta ETFs. Panel A summarizes which sectors are represented, and Panel B summarizes which Smart Beta strategies are represented and the average number of claimed strategies. The sample period is January 2000 to June 2018.

Interpretation: The sample of ETFs spans a variety of sectors and Smart Beta categories.

	N	Mean
Panel A: Sector Flags		
Basic Materials	210	0.05
Consumer Goods	210	0.06
Consumer Services	210	0.07
Financial Services	210	0.15
Health and Biotechnology	210	0.11
Industrials	210	0.10
Natural Resources	210	0.16
Real Estate	210	0.10
Science and Technology	210	0.13
Telecommunications	210	0.02
Utilities	210	0.06
Panel B: Smart Beta Flags		
Value	170	0.44
Growth	170	0.28
Small Cap	170	0.29
Momentum	170	0.24
Profitability	170	0.13
Quality	170	0.15
Low Volatility	170	0.22
Total Flags	170	1.75

Table B2: ETF Fixed Effects.

Description: The table displays quarterly panel regressions of Log Market Cap on ETF characteristics with ETF and quarter-year fixed effects. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. All variables are defined in Table A1. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Inferences from our main regression specifications are mostly unchanged using ETF fixed effects. The coefficient on the Dominated indicator variable is positive and statistically significant for Index ETFs, but results for all other categories are consistent with the base case. The dominated funds in strategy-salient categories manage significant excess assets.

	Log Market Cap					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Dominated	0.14***	-0.15***	0.26***	0.15	0.09**	0.35***
	(5.79)	(-4.06)	(4.39)	(1.22)	(2.64)	(9.11)
Expense Ratio	-3.57***	0.06	1.06***	-0.40	-3.03***	0.46*
	(-4.17)	(0.86)	(3.96)	(-0.40)	(-6.60)	(1.95)
Bid-Ask Spread	-0.53**	-0.23*	-0.08	-0.01	-1.35***	-0.21**
	(-2.05)	(-1.87)	(-0.97)	(-0.42)	(-6.77)	(-2.34)
Trading Turnover	-0.00	0.01***	-0.06**	0.01	0.01**	0.00
	(-0.48)	(3.19)	(-2.12)	(0.64)	(2.38)	(0.17)
Turnover Ratio	0.07	-1.64***	0.23**	0.01	-0.28***	-0.17***
	(0.39)	(-9.02)	(2.45)	(1.46)	(-6.70)	(-4.77)
Quarter Return	0.00	0.01***	-0.00	-0.01	0.01***	-0.00
	(0.06)	(4.86)	(-0.87)	(-0.62)	(5.21)	(-0.31)
Alpha	-0.44***	0.34**	0.27	0.76***	0.10**	0.01***
	(-4.36)	(2.27)	(1.42)	(2.85)	(2.18)	(2.83)
Uniqueness	-1.70***	0.46	-2.40***	-1.77***	-1.99***	-2.05***
	(-5.95)	(1.43)	(-7.62)	(-4.26)	(-15.26)	(-8.75)
Log ETF Age	1.51***	1.82***	0.49***	0.49*	1.18***	1.11***
	(19.72)	(13.33)	(3.27)	(1.70)	(12.78)	(14.99)
Log Search Volume	0.03***	0.04***	0.13***	0.03	0.05***	0.03***
	(3.46)	(3.77)	(6.83)	(1.67)	(3.82)	(5.25)
Sponsor Tilt	0.20	1.90***	1.33***	1.62***	2.13***	-0.27
	(1.63)	(8.42)	(5.31)	(3.30)	(10.67)	(-1.45)
Observations	2,043	2,312	2,057	682	4,719	5,046
Adjusted R^2	0.972	0.928	0.933	0.901	0.866	0.939
ETF Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table B3: ETF Family Fixed Effects.

Description: The table displays quarterly panel regressions of Log Market Cap on ETF characteristics with ETF family and quarter-year fixed effects. Column (1) focuses on Index ETFs, Column (4) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. All variables are defined in Table A1. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Inferences from our main regression specifications are unchanged using ETF family fixed effects.

	Log Market Cap					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Dominated	-0.26***	-0.17***	0.43***	1.00***	0.10*	0.60***
	(-4.04)	(-3.46)	(5.19)	(5.89)	(1.89)	(8.84)
Expense Ratio	-2.79***	-1.03***	-0.37**	-0.22	-1.40***	-3.23***
	(-9.39)	(-4.29)	(-2.04)	(-0.40)	(-6.70)	(-16.64)
Bid-Ask Spread	-2.15**	-0.76***	-0.23***	0.01	-3.30***	-0.56***
	(-2.54)	(-3.02)	(-2.83)	(0.30)	(-6.89)	(-3.53)
Trading Turnover	0.07***	0.01***	0.03	-0.01	0.07***	0.07***
	(6.12)	(4.98)	(0.76)	(-0.55)	(5.62)	(3.27)
Turnover Ratio	-0.53***	-2.11***	0.00	-0.00	-0.60***	-0.30***
	(-3.45)	(-10.81)	(0.01)	(-0.27)	(-9.65)	(-7.30)
Quarter Return	0.01	0.01***	-0.01	-0.01	0.01***	0.00
	(0.59)	(3.56)	(-0.62)	(-0.98)	(4.15)	(0.25)
Alpha	-0.97***	-0.20	1.17***	0.29	0.15*	-0.00
	(-3.51)	(-0.91)	(5.20)	(1.07)	(1.80)	(-0.90)
Uniqueness	-6.15***	-1.76***	-3.79***	-3.44***	-0.62***	-3.00***
	(-7.25)	(-3.61)	(-10.75)	(-6.37)	(-4.65)	(-15.48)
Log ETF Age	2.91***	1.38***	1.38***	1.42***	1.38***	1.17***
	(25.89)	(8.48)	(19.80)	(7.36)	(23.12)	(17.17)
Log Search Volume	0.08***	0.00	0.12***	-0.01	0.03***	0.10***
	(6.30)	(0.54)	(9.75)	(-0.36)	(9.33)	(18.42)
Sponsor Tilt	1.25***	1.31***	0.04	1.03**	2.17***	1.59***
	(5.02)	(3.65)	(0.13)	(2.24)	(11.30)	(6.16)
Observations	2,043	2,312	2,057	683	4,719	5,046
Adjusted R^2	0.809	0.802	0.753	0.751	0.603	0.750
ETF Family Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table B4: ETF Clustering.

Description: The table displays quarterly panel regressions of Log Market Cap on ETF characteristics. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. All variables are defined in Table A1. Standard errors are clustered at the quarter-year and ETF levels, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Inferences from our main regression specifications are unchanged when clustering standard errors at the ETF-year-quarter level, as the dominated funds in strategy-salient categories manage significant excess assets.

	Log Market Cap					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Dominated	-0.30	-0.14	0.51*	1.20***	0.28**	0.81***
	(-1.57)	(-0.79)	(1.97)	(3.29)	(2.03)	(5.38)
Expense Ratio	-3.19*	-3.10***	-2.27***	0.30	-0.06	-1.84***
	(-1.97)	(-3.35)	(-3.43)	(0.60)	(-0.08)	(-4.59)
Bid-Ask Spread	-2.32*	-0.65*	-0.27	-0.04	-4.03***	-0.67***
	(-1.94)	(-1.75)	(-1.46)	(-0.76)	(-5.58)	(-2.77)
Trading Turnover	0.08***	0.03*	-0.03	-0.04**	0.10***	0.08
	(3.78)	(1.74)	(-0.36)	(-2.49)	(4.59)	(1.62)
Turnover Ratio	-0.26	-2.17***	-0.07	0.03***	-0.33	-0.20*
	(-0.27)	(-4.51)	(-1.41)	(4.60)	(-1.62)	(-1.78)
Quarter Return	0.01	0.01***	-0.01	-0.01	0.01***	-0.01
	(0.95)	(4.54)	(-0.50)	(-0.87)	(3.42)	(-0.48)
Alpha	-0.74	-0.29	0.57	0.24	0.21	-0.01
	(-1.50)	(-0.78)	(1.08)	(0.49)	(1.27)	(-0.73)
Uniqueness	-7.05***	-2.67**	-4.32***	-4.69***	0.35	-2.53***
	(-3.98)	(-2.58)	(-6.02)	(-5.91)	(0.57)	(-4.05)
Log ETF Age	2.41***	2.00***	1.57***	1.06***	1.06***	1.13***
	(9.51)	(11.52)	(5.02)	(3.42)	(6.57)	(7.65)
Log Search Volume	0.07	0.00	0.11***	-0.00	0.01	0.08***
	(1.37)	(0.10)	(3.14)	(-0.15)	(0.48)	(5.14)
Sponsor Tilt	2.26***	1.03	0.75	1.62**	1.92***	2.79***
	(2.93)	(1.50)	(0.50)	(2.04)	(2.99)	(5.95)
Observations	2,043	2,312	2,057	683	4,719	5,046
Adjusted R^2	0.765	0.750	0.675	0.584	0.500	0.692
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
ETF-Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table B5: Continuous Measure for Dominated ETFs.

Description: The table displays quarterly panel regressions of Log Market Cap on ETF characteristics. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. All variables are defined in Table A1. The Dominated Fee Gap measures the difference in expense ratios, measured in basis points per year, for each dominated ETF relative to its dominant ETF. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Inferences from our main regression specifications are mostly unchanged using a continuous measure of excess costs. The coefficient on the Dominated Fee Gap measure is statistically insignificant for Sector Index ETFs, but results for all other categories are consistent with the base case. The dominated funds in strategy-salient categories have positive estimated relations between excess fees and fund size.

	Log Market Cap					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Dominated Fee Gap	-2.74***	0.07	0.29**	2.35***	0.94***	1.13***
	(-5.62)	(0.30)	(2.03)	(9.78)	(5.55)	(7.81)
Expense Ratio	-1.56***	-3.39***	-2.41***	-0.07	-0.18	-2.44***
	(-2.90)	(-13.50)	(-15.07)	(-0.42)	(-0.98)	(-13.44)
Bid-Ask Spread	-2.44**	-0.63**	-0.21*	-0.00	-4.02***	-0.57***
	(-2.56)	(-2.21)	(-1.86)	(-0.03)	(-6.68)	(-4.14)
Trading Turnover	0.08***	0.03***	-0.02	-0.04***	0.09***	0.12***
	(6.42)	(7.16)	(-0.52)	(-3.76)	(6.68)	(4.41)
Turnover Ratio	-0.48**	-2.04***	-0.08***	0.03***	-0.34***	-0.19***
	(-2.30)	(-9.62)	(-4.61)	(6.65)	(-7.19)	(-3.68)
Quarter Return	0.01	0.01***	-0.01	-0.01	0.01***	-0.01
	(0.90)	(4.13)	(-0.55)	(-1.06)	(3.41)	(-0.85)
Alpha	-0.80**	-0.29	0.53**	0.22	0.22**	-0.01
	(-2.38)	(-1.21)	(2.17)	(1.23)	(2.56)	(-0.98)
Uniqueness	-7.32***	-2.40***	-4.98***	-4.92***	0.38**	-3.15***
	(-9.39)	(-4.42)	(-17.35)	(-15.65)	(2.42)	(-11.52)
Log ETF Age	2.40***	2.04***	1.63***	1.10***	1.07***	1.28***
	(32.64)	(29.61)	(23.87)	(9.73)	(15.70)	(29.51)
Log Search Volume	0.08***	0.00	0.12***	-0.00	0.01***	0.09***
	(5.80)	(0.42)	(9.64)	(-0.10)	(2.90)	(19.17)
Sponsor Tilt	2.27***	1.11***	0.82***	1.86***	1.79***	3.00***
	(8.32)	(2.92)	(3.54)	(4.91)	(9.26)	(11.03)
Observations	2,043	2,312	2,057	683	4,719	5,046
Adjusted R^2	0.767	0.748	0.668	0.568	0.502	0.678
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table B6: Additional ETF Characteristics.

Description: The table displays quarterly panel regressions of Log Market Cap on ETF characteristics. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. All Index ETFs in the sample allow for in-kind creation and redemption, and no Index, Sector Index, Sector Active, or Smart Beta ETFs have an ESG focus. We omit these variables from the corresponding regressions. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Inferences from our main regression specifications are unchanged when including additional control variables.

	Log Market Cap					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Dominated	-0.28***	-0.18**	0.66***	1.29***	0.28***	0.81***
	(-3.38)	(-2.26)	(7.08)	(9.72)	(4.58)	(10.74)
Expense Ratio	-3.40***	-3.06***	-1.64***	0.41**	-0.15	-1.86***
	(-9.70)	(-7.82)	(-13.60)	(2.06)	(-0.81)	(-12.11)
Bid-Ask Spread	-2.55***	-0.84***	-0.24**	-0.06*	-4.03***	-0.66***
	(-2.66)	(-3.10)	(-2.46)	(-1.85)	(-6.63)	(-4.70)
Trading Turnover	0.07***	0.04***	-0.00	-0.02**	0.09***	0.08***
	(5.84)	(7.05)	(-0.12)	(-2.02)	(6.68)	(3.42)
Turnover Ratio	-0.17	-2.22***	-0.03*	0.03***	-0.33***	-0.23***
	(-0.80)	(-10.43)	(-1.84)	(6.61)	(-7.18)	(-5.03)
Quarter Return	0.01	0.01***	-0.00	-0.01	0.01***	-0.01
	(1.01)	(3.86)	(-0.33)	(-0.84)	(3.59)	(-0.43)
Alpha	-1.03***	-0.66***	0.78***	0.45***	0.22**	-0.01
	(-3.22)	(-3.21)	(3.22)	(2.81)	(2.55)	(-0.93)
Uniqueness	-7.32***	-2.54***	-3.84***	-4.05***	0.32**	-2.47***
	(-9.72)	(-4.33)	(-15.11)	(-11.58)	(2.05)	(-10.21)
Log ETF Age	2.49***	1.00***	1.22***	1.22***	1.03***	1.17***
	(35.79)	(7.36)	(14.24)	(10.28)	(13.74)	(22.07)
Log Search Volume	0.08***	-0.01	0.12***	0.00	0.01**	0.08***
	(6.20)	(-1.12)	(10.52)	(0.32)	(2.47)	(18.72)
Sponsor Tilt	2.13***	0.91**	0.31	1.85***	1.89***	2.77***
	(7.66)	(2.34)	(1.48)	(5.56)	(10.37)	(11.25)
Log Family Size	-0.10***	0.35***	0.14***	-0.02	0.00	-0.02**
	(-7.34)	(12.09)	(12.88)	(-1.27)	(0.08)	(-2.04)
In Kind Creation			0.12	0.77***	0.78***	0.74***
			(1.23)	(4.50)	(7.45)	(5.53)
ESG			-0.64***	1.93***		
			(-7.14)	(6.82)		
Observations	2,043	2,312	2,057	683	4,719	5,046
Adjusted R^2	0.771	0.770	0.698	0.604	0.505	0.694
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table B7: Dominated ETF Institutional Allocation by Group.

Description: The table displays quarterly panel regressions of Log Institutional Market Cap on ETF characteristics and indicators for each of five sets of non-overlapping groups. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. Controls are Expense Ratio, Bid-Ask Spread, Trading Turnover, Turnover Ratio, Quarter Return, Alpha, Uniqueness, Log ETF Age, Log Search Volume, and Sponsor Tilt. All variables are defined in Table A1. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Inferences from regressions that decompose dominated ETFs into groups are similar when studying allocations by institutions as when studying total allocations of all ETF investors.

	Log Inst Market Cap					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Panel A: Degree of Domination						
Dominated 1x	-0.02	0.27	1.02***	1.02*	0.13	1.14***
	(-0.14)	(1.63)	(5.15)	(1.77)	(1.34)	(9.84)
Dominated 2x	-0.63***	-0.37***	0.69***	0.65**	0.25***	0.63***
	(-4.73)	(-3.13)	(2.78)	(2.36)	(2.96)	(5.39)
Dominated 3x	-1.05***	-0.75***	0.83***	0.18	0.01	0.63***
	(-8.79)	(-5.85)	(5.54)	(0.98)	(0.10)	(4.78)
Dominated 4x	-1.59***	-0.53***	0.52***	1.18***	0.40**	0.89***
	(-8.11)	(-4.35)	(5.24)	(5.36)	(2.27)	(9.14)
Panel B: Dominated Frequency						
Always Dominated	-0.23	0.98***	1.43***	1.24***	0.21	1.37***
	(-1.29)	(4.00)	(10.76)	(3.01)	(1.16)	(13.46)
Mostly Dominated	-0.68***	-0.56***	0.59***	1.16***	0.22***	1.07***
	(-6.90)	(-4.30)	(5.06)	(5.23)	(2.70)	(12.70)
Sometimes Dominated	-0.22	-0.17*	0.27**	0.41	0.14	0.27**
	(-1.56)	(-1.90)	(2.02)	(1.39)	(1.55)	(2.40)
Panel C: Dominated Timing						
1st Year Dominated	-0.32**	-0.12	0.74***	1.19***	0.14	1.07***
	(-2.37)	(-0.99)	(6.70)	(5.36)	(1.50)	(12.01)
2nd Year Dominated	-0.44***	-0.07	-0.18	0.87**	0.70***	1.22***
	(-3.62)	(-0.60)	(-1.12)	(2.65)	(5.14)	(11.90)
3rd Year Dominated	-1.03***	-0.48***	0.52***		0.13	0.73***
	(-9.16)	(-4.12)	(2.66)		(1.48)	(7.86)
4th+ Year Dominated	0.03	-0.13	0.74***	-0.36	-0.16	-0.02
	(0.18)	(-1.56)	(5.49)	(-1.43)	(-0.87)	(-0.14)
Panel D: Early vs Late Entrant						
Early Entrant Dominated	-0.38***	-0.44***	0.35**		0.19	1.73***
	(-4.08)	(-3.67)	(2.24)		(1.47)	(18.30)
Late Entrant Dominated	-0.52***	0.17	0.70***	1.06***	0.19**	0.65***
	(-3.34)	(1.25)	(6.42)	(5.09)	(2.46)	(7.31)
Panel E: Fund Family						
Family Dominated	-0.52***	-0.27***	0.80***	1.02***	-0.06	0.90***
	(-4.01)	(-2.93)	(7.52)	(3.77)	(-0.56)	(10.40)
Non-Family Dominated	-0.23*	-0.13	0.60***	1.10***	0.25***	0.81***
	(-1.90)	(-1.35)	(5.04)	(4.43)	(3.01)	(7.51)
Observations	2,043	2,312	2,057	683	4,719	5,046
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes

Table B8: Dominated ETF Flow by Group.

Description: The table displays quarterly panel regressions of Flow on ETF characteristics and indicators for each of five sets of non-overlapping groups. Column (1) focuses on Index ETFs, Column (2) focuses on Sector Index ETFs, Column (3) focuses on Quasi-Index ETFs, Column (4) focuses on Active ETFs, Column (5) focuses on Sector Active ETFs, and Column (6) focuses on Smart Beta ETFs. Controls are Expense Ratio, Bid-Ask Spread, Trading Turnover, Turnover Ratio, Quarter Return, Alpha, Uniqueness, Log ETF Age, Log Search Volume, Sponsor Tilt, and Lag Market Cap. All variables are defined in Table A1. Standard errors are clustered at the quarter-year level, t-statistics are shown below the estimates in parentheses, and ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is January 2000 to June 2018.

Interpretation: Inferences from regressions that decompose dominated ETFs into groups are similar as when studying flows of all dominated ETFs.

	Flow					
	(1) Index	(2) Sector Index	(3) Quasi-Index	(4) Active	(5) Sector Active	(6) Smart Beta
Panel A: Degree of Domination						
Dominated 1x	-0.01	-0.01	0.01	-0.03	0.02	-0.03*
	(-0.32)	(-0.39)	(0.29)	(-0.72)	(0.84)	(-1.78)
Dominated 2x	-0.04	-0.05***	-0.04	0.12	0.05	-0.02
	(-1.09)	(-2.91)	(-1.03)	(1.60)	(1.18)	(-1.24)
Dominated 3x	-0.03	-0.05**	-0.00	-0.07	0.01	-0.05***
	(-1.07)	(-2.39)	(-0.13)	(-1.31)	(0.36)	(-2.96)
Dominated 4x	-0.04	-0.04	0.00	0.03	0.00	-0.02*
	(-0.98)	(-1.36)	(0.11)	(0.80)	(0.06)	(-1.83)
Panel B: Dominated Frequency						
Always Dominated	-0.02	-0.03	0.00	0.10**	-0.16***	-0.03
	(-0.45)	(-0.76)	(0.13)	(2.50)	(-4.62)	(-1.51)
Mostly Dominated	-0.03	-0.04**	-0.01	-0.01	0.05	-0.03**
	(-1.12)	(-2.40)	(-0.56)	(-0.22)	(1.55)	(-2.30)
Sometimes Dominated	-0.02	-0.03	0.01	-0.05	0.01	-0.02
	(-0.59)	(-1.65)	(0.45)	(-1.13)	(0.24)	(-1.45)
Panel C: Dominated Timing						
1st Year Dominated	-0.02	-0.04**	-0.01	0.03	0.02	-0.03**
	(-0.75)	(-2.00)	(-0.32)	(0.92)	(1.01)	(-2.41)
2nd Year Dominated	-0.02	-0.01	0.02	-0.12**	0.03	-0.02
	(-0.68)	(-0.59)	(0.48)	(-2.61)	(0.97)	(-1.52)
3rd Year Dominated	-0.02	-0.05**	-0.01		0.01	-0.05**
	(-1.01)	(-2.40)	(-0.32)		(0.13)	(-2.22)
4th+ Year Dominated	-0.02	-0.04**	0.02	0.04	0.01	-0.01
	(-0.63)	(-2.12)	(1.16)	(0.52)	(0.35)	(-0.93)
Panel D: Early vs Late Entrant						
Early Entrant Dominated	0.01	-0.04**	0.04*		0.06*	0.01
	(0.28)	(-2.27)	(1.97)		(1.85)	(0.40)
Late Entrant Dominated	-0.05	-0.03	-0.01	0.02	0.01	-0.03**
	(-1.52)	(-1.52)	(-0.31)	(0.48)	(0.52)	(-2.50)
Panel E: Fund Family						
Family Dominated	-0.02	-0.02	0.02	0.06	0.01	-0.03**
	(-0.82)	(-1.04)	(0.84)	(1.42)	(0.20)	(-2.33)
Non-Family Dominated	-0.02	-0.04**	-0.01	-0.03	0.02	-0.02
	(-0.69)	(-2.45)	(-0.58)	(-0.83)	(0.84)	(-1.49)
Observations	1,997	2,257	1,965	634	4,564	4,876
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Cluster	Yes	Yes	Yes	Yes	Yes	Yes