Competition for Attention in the ETF Space

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PRELIMINARY

Abstract

Exchange-Traded Funds (ETFs) are among the most prominent financial innovations in the last three decades. While early ETFs offered broad-based portfolios at low cost, in later years, issuers began launching thematic ETFs that hold niche portfolios and charge high fees. Thematic ETFs deliver negative risk-adjusted performance, which does not reflect a hedging premium. Rather, thematic ETFs underperform because the stocks that they hold are overvalued. New thematic ETFs hold attention-grabbing stocks (high past performance, media exposure and sentiment). After launch, these securities underperform as the hype around them vanishes. Thematic ETFs are favored by unsophisticated retail investors. Overall, financial innovation in the ETF space follows two paths: broad-based products that cater to cost-conscious investors (the 'Walmarts'), and expensive thematic ETFs that compete for the attention of sentiment-driven investors (the 'Starbucks').

Keywords: ETFs, investor attention, sentiment, financial innovation, attention
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1 Introduction

In the last decades, the asset management industry has been disrupted by the growth of Exchange Traded Funds (ETFs), i.e., investment vehicles that replicate the performance of indexes and can be traded continuously in the stock market. As of the end of 2020, the assets managed by ETFs in the U.S. alone have surpassed the $5 trillion mark, amounting to about 17% of the total assets in U.S. investment companies. To date, over 3,400 have been launched covering all the way from broad-based indexes like the S&P 500 to niche investment themes, such as a trade war, cannabis, vegan products, work from home, and COVID-19.

More broadly, ETFs are considered the epitome of the current trend of democratization of the investment process.[1] Investors have gained direct access to financial markets (e.g., low-cost online brokers and self-managed 401K plans) as well as to real-time financial information through formal sources and social media. The abundance of information that investors face requires suppliers of financial products to compete for investors' attention. However, most ETFs are 'plain vanilla' investments; hence issuers cannot tout managers' past performance and skill (as in mutual funds, see Jain and Wu, 2000) or promise high headline returns (as in structured products, see Célérier and Vallée, 2017; Vokata, 2020).[2] For these reasons, the ETF market offers an opportunity to examine the evolution of financial innovation stripped-down from managerial skill and product complexity.

We explore the economic motives fueling the introduction and proliferation of ETFs, using the framework of Bordalo, Gennaioli, and Shleifer (2016) as a guide for the analysis. This theory models the behavior of suppliers in a market in which consumers have limited attention. To attract consumers, firms can make different product attributes salient. As a result, competition can occur along the "price" and "quality" dimensions. In the context of financial innovation, quality translates into product attributes that appeal to investors. Consistent with this view, we document that some ETFs offer low-cost access to broad-based indexes while others charge high fees and offer access to specialized segments of the market that respond to investors' preference for popular themes. Analogously to the evidence for close-end funds in the 1980s (Lee et al., 1991), stocks in the portfolios of thematic ETFs are overvalued and therefore these ETFs deliver negative performance in the following years. Overall, our findings suggest that the most important financial innovation of the last three decades, originally designed to promote cost-efficiency and diversification, has also provided

[1]See Barbara Novick (Blackrock's Vice Chairman and co-founder), "How Index Funds Democratize Investing," *Wall Street Journal*, January 8, 2017.

[2]Other examples include the issuance of closed-end funds (Lee, Shleifer, and Thaler, 1991), fixed income securities (Greenwood and Hanson, 2013; Gennaioli, Shleifer, and Vishny, 2012), mutual funds (Massa, 1998; Cooper, Gulen, and Rau, 2005; Kostovetsky and Warner, 2020) and equity offerings (Baker and Wurgler, 2007).

a platform to cater to investors' irrational expectations.

Our study is organized in two parts. In the first part, we describe the segmentation in the ETF industry that corresponds to the price-salient and a quality-salient equilibria in Bordalo et al. (2016). Our sample consists of all equity ETFs that are traded in the U.S. equity market. As of December 2019, broad-based ETFs manage about $2 trillion, while thematic products hold about $457 billion. Despite its smaller market share, the thematic ETF segment generates about 40% of the industry's revenues. We show that, in the market for broad-based products, ETFs hold large portfolios and compete on price by offering similar portfolios at a low cost. In the thematic segment, ETFs hold undiversified and differentiated portfolios and charge higher fees.[3] Corroborating further the evidence of multiple equilibria, we find a marked difference in the sensitivity of investors' demand to the cost of holding the ETF for the two groups of products. Specifically, flows to broad-based ETFs display a significantly higher sensitivity to fees, whereas flows to thematic ETFs are unrelated to fees and respond more strongly to positive past performance.

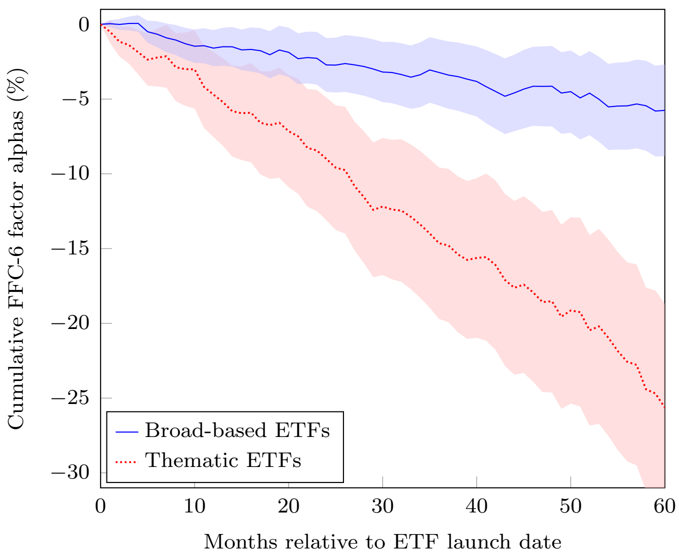
In the second part of our work, we investigate the purpose of thematic ETFs, i.e., we study the nature of 'quality competition' in the ETF space. The obvious conjecture is that thematic ETFs charge high fees because they are able to generate better performance, for example, by picking investment styles that will outperform. Our tests show that this is not the case. In fact, we find that thematic ETFs' performance is disappointing after adjusting for their risk exposure. A portfolio of all thematic ETFs earns a negative risk-adjusted performance of 3.1% per year, after fees. This underperformance is due mostly to newly launched thematic ETFs, which lose 5% per year in risk-adjusted terms. In comparison, the performance of broad-based ETFs is slightly negative, however, statistically indistinguishable from zero. Figure 1 illustrates this result.

We then explore two potential explanations for the severe underperformance of thematic ETFs that we observe. The first conjecture is that thematic ETFs are used by rational investors to hedge their exposure to risk factors. According to this interpretation, through these products, investors obtain insurance for risks to which they are exposed and, for this reason, they are willing to bear a cost in terms of lower returns. More broadly, this explanation relates to the view of financial innovation as a way to achieve market completion (Allen and Gale, 1994; Duffie and Rahi, 1995). Specifically, ETFs can help investors hedge their positions by offering portfolios of existing securities, which ultimately reduce investors' transaction and search costs. However, we do not find evidence consistent with an insurance motive. For example, the portfolio of stocks that are most negatively correlated with the

[3]Several studies find that differentiation in portfolio focus exist also in the mutual fund industry (Massa, 1998; Cooper et al., 2005; Kostovetsky and Warner, 2020).

Figure 1. Performance of ETFs Around Launch

The figure shows the performance of ETFs around launch, split by groups of broad-based and thematic ETFs. We form 60 calendar-time portfolios that include returns of ETFs in their month +1, +2, . . . , and +60 since the launch month 0. The portfolio returns are value-weighted using one-month-lagged market capitalization as weights. To adjust returns for risk factors, we estimate Fama-French-Carhart 6 factor model (FFC-6) alphas of the portfolios using squared roots of the number of ETFs in each portfolio-month as weights. The lines represent cumulative FFC-6 alphas of the 60 ETF portfolios and the shaded areas represent 95% confidence intervals.



portfolio of all thematic ETFs does not earn abnormally positive returns, which should be the case if it was a risk factor of hedging concern. While an insurance motive predicts that investors are expecting low returns, poor performance of thematic ETFs is accompanied with negative capital flows, suggesting that investors are disappointed by the low returns. Relatedly, we document that stocks that are included in thematic ETFs experience, after launch, a steep drop in their media sentiment and earnings surprises relative to the pre-launch period.

The second explanation is that the demand for thematic ETFs comes from unsophisticated investors who chase investment ideas that, in their view, produce higher expected returns. Our results are consistent with this interpretation. Newly-launched thematic ETFs hold portfolios of securities in attention-grabbing segments of the market: these are stocks that experienced recent price run-ups, had recent media exposure (especially positive exposure), high analyst growth expectations, and in general display traits that were previously-shown to indicate overvaluation (high market-to-book and high short interest). We also find evidence of catering to preferences for gambling (Brunnermeier and Parker, 2005; Brunnermeier, Gollier, and Parker, 2007; Mitton and Vorkink, 2007; Barberis and Huang, 2008; Kumar, 2009): thematic ETFs contain securities with relatively more positively-skewed returns. Moreover, the investor clientele of thematic ETFs has a greater fraction of retail investors, who are typically considered less sophisticated. Relatedly, thematic ETFs are very popular among sentiment-driven investors, i.e., those that trade through the online platform Robinhood, which has become famous in recent years for hosting investment frenzies. Finally, thematic ETF investors are more prone to positive feedback trading (De Long, Shleifer, Summers, and Waldmann, 1990). Put together, these results suggest that ETF providers cater to irrational investors with extrapolative expectations (Barberis and Shleifer, 2003; Greenwood and Shleifer, 2014; Barberis, Greenwood, Jin, and Shleifer, 2018), i.e., those viewing recent performance of a security or a sector as representative of its future performance. These investors also display neglect for the risks that arise from the under-diversification of thematic portfolios, consistent with the theory of Gennaioli et al. (2012).

Overall, our results provide a new narrative for the evolution of the most transformative financial innovation of the last three decades. The original ETFs, which are broad-based products, are beneficial investment platforms, as they reduce transaction costs and provide diversification. Thematic ETFs ride the same wave of financial innovation. However, these products appeal to unsophisticated investors who chase past performance and neglect the risks arising from the under-diversified portfolios. Thematic ETFs, on average, have generated disappointing performance for their investors.

2 Data

We use data on ETFs traded in the U.S. market from the Center for Research in Security Prices (CRSP) between 1993 and 2019. We focus on equity ETFs that trade on the U.S. stock market. This choice allows us to more closely benchmark the ETF portfolios to broad-based U.S. stock indexes. Therefore, we exclude ETFs that are classified as non-equity, foreign equity, inverse, or leveraged. The final sample contains 1,086 distinct U.S. equity ETFs which satisfy all requirements. Appendix A introduces the reader to the mechanics of ETFs. We provide detailed data sources in Appendix B and variable description in Appendix C. the

We compute ETFs' portfolio holdings by combining Thomson Reuters Global Mutual Fund Ownership and CRSP Mutual Fund Holdings databases. We start with the dataset that includes holdings information on the earliest date (closest to the launch date). We use the other dataset to complement missing data when needed.

In addition, we use stock-level data from additional sources: market data from CRSP and Compustat, analyst expectations from I/B/E/S, firm-level news from RavenPack News Analytics, 13F institutional ownership data from Thomson Reuters, and Robinhood users data from Robintrack.

3 The "Walmarts" and "Starbucks" of the ETF World

3.1 Theoretical Background

The ETF market has developed substantially since the 1990s. To date, in the U.S. alone, over 3,000 exchange traded funds have been launched, of these, more than 1,000 invest in U.S. equities. These ETFs differ in the breadth of their holdings (ranging from a few stocks to over 3,000 stocks) and in the fees that they charge (ranging from 4 bps to over 150 bps per year). What are the factors that drive the introduction of new products in this space?

Historically, the first ETFs, launched in the mid-1990s, tracked broad-based indexes, held large portfolios, and charged low fees. These products were viewed as alternative investment vehicles to index futures contracts. Towards the late 1990s, ETFs were marketed as alternative investment vehicles to index mutual funds.[4] Thematic ETFs became to appear around the dot.com boom, 1999; they tracked primarily the technology sector and charged higher fees.

We argue that the observed plethora of ETF products is a result of issuers competing on investors' attention through emphasizing *either* the low price *or* the product's unique features. If consumers' demand is based on salient features—price or variety—relative to the incumbent competition, firms would attempt to attract consumers' attention based on these features.

Bordalo, Gennaioli, and Shleifer (2016) apply this idea to describe competitive strategies in product markets and extend their analysis to financial markets, specifically—financial innovation. Product markets can gravitate around either *i*) a price-salient equilibrium, in which products are commoditized and producers compete on low prices (the "Walmarts"), or *ii*) a quality-salient equilibrium in which prices are high and producers differentiate themselves by offering different product features (the "Starbucks"). Paralleling this market structure, in financial markets, there are products that improve transaction efficiency, and there are products that attract investors' attention to specific features, like high promised returns ("reaching for yield"), while shrouding risk.

We argue that these two equilibria provide a fitting description of the situation in the ETF market. The "price" feature is reflected in the fees that ETFs charge. Thus, the inexpensive and broad-based index tracking ETFs are the commoditized products which

[4]For example, Guedj and Huang (2009) explain that ETFs have liquidity advantages over index funds but tax disadvantages, and therefore may appeal to different clienteles.

could be mapped to the price-salient equilibrium (the Walmarts of the ETF world). This group of ETFs appeals to price-conscious investors who seek exposure to an asset class at the lowest possible cost. Instead, more expensive, less-diversified ETFs are part of the quality-salient equilibrium (the Starbucks). The latter products are labelled 'thematic' in the ETF world. Investors in these ETFs are less concerned about paying a high price or losing diversification as long as they can get exposure to their desired themes. In this segment of the market, ETF issuers attract investors' attention by designing products that cater investors' expectations of high future returns.

In this framework, an ETF's expected return is a measure of product quality, or variety.[5] Importantly, some investors may not act rationally when forming expectations about future returns. For example, investors may suffer from representativeness bias and therefore extrapolate past performance to the future (Greenwood and Shleifer, 2014; Barberis et al., 2018). Catering to this audience, issuers can make the quality characteristic salient by launching ETFs focusing on segments of the market that experienced superior past performance.

One can extend the notion of "quality" beyond expected return. For example, some literature suggests that investors have a preference for gambling (Brunnermeier and Parker, 2005; Brunnermeier et al., 2007; Mitton and Vorkink, 2007; Barberis and Huang, 2008; Kumar, 2009). In this case, issuers would attract investors by offering products with a positively-skewed payoff profile. Moreover, investors may be wishing to invest in themes that they fancy, such as responsible and sustainable manufacturing, or firms that comply with religious values.[6] Therefore, new ETFs could cater to this demand by constructing portfolios around these themes.

3.2 Testable Predictions

The theoretical framework discussed above allows us derive some testable implications. The predictions of the Bordalo et al. (2016) model can be tested against the traditional interpretation of financial innovation.

According to the traditional view, financial innovation contributes to complete the market, allows investors to achieve a broader set of payoffs (Allen and Gale, 1994; Duffie and Rahi, 1995). Even though ETFs replicate cash flows profiles of securities that already exist in the market, they increase the accessibility of these portfolios to investors, by reducing

[5] Supporting this view, previous research shows that financial intermediaries tend to emphasize products' promised headline return salient while shrouding associated risk (Henderson and Pearson, 2011; Célérier and Vallée, 2017; Vokata, 2020).

[6] Some authors argue that an investment that complies with investors' system of beliefs generates non-pecuniary benefits in their utility function (as in Fama and French, 2007; Pastor, Stambaugh, and Taylor, 2019).

search and trading costs. The variety of products coming to the market reflects the heterogeneity in investors' hedging needs. Viewed through this lens, financial innovation responds to rational investors' demand and is welfare improving.

The two frameworks converge on the rationale for inexpensive broad-based ETFs. According to the two views, these products fulfill investors' needs, diversification and hedging, at a low cost.

The two frameworks, however, differ in the interpretation of the reason for the existence of thematic ETFs. According to the traditional view, these underdiversified products must offer benefits to investors as hedging tools.

In contrast, according to the "competition for attention" view, thematic ETFs are designed to attract consumers' attention to a feature that is different from their price. In the context of financial innovation, investors' attention could be attracted by offering access to a theme that matches their expectations of future performance. If investors have high sentiment about a specific investment idea, then new ETFs are likely to be launched around this theme.

Given our empirical setting, we introduce an additional conjecture. Specifically, if there are limits to arbitrage in the underlying securities' market, it is plausible that the same sentiment that props stock prices will be reflected in the demand for ETFs. For example, investors' demand for cannabis-related ETFs will be high when cannabis stocks are overvalued. Therefore, new thematic ETFs could underperform due to the overvaluation of their portfolio holdings.

To summarize, the "attention for competition" framework predicts that newly-launched thematic ETFs focus on attention-grabbing themes. Stocks, in these ETFs are likely to be overvalued, and therefore these ETFs are likely to deliver negative risk-adjusted performance that is disappointing for investors. In addition, they are likely to attract unsophisticated investors.

4 Empirical Analysis: Segmentation in the ETF Space

Now we turn to describing the structure of equity-focused ETFs that are traded in the U.S. stock market and classify ETFs based on their investment objective: *broad-based* versus *thematic* products. Relying on the commercial data provider Bloomberg, we classify ETFs as thematic if they invest in a specific industry or track multiple industries that are tied by a theme.[7] The remaining equity ETFs, that lack an industry focus, are classified as broad-

[7] In particular, we refer to the Bloomberg field $FUND\_INDUSTRY\_FOCUS$. We categorize as thematic the ETFs for which this field reports the word 'thematic' or the name of a specific industry.

based ETFs. Over the sample period, there are 613 broad-based ETFs and 473 thematic ETFs. Figure 2 shows time-series evolution of the assets under management (AUM), implied revenues (percentage fees times AUM), as well as the time series of ETF launches and closures.

Panels (a) and (b) show that the AUM managed by broad-based ETFs grow exponentially over the years, whereas the growth of the assets in thematic ETFs is less striking. By the end of 2019, broad-based ETFs account for about 80% of the assets invested in equity-based ETFs, and thematic ETFs account for the remaining 20%. Despite their relatively small share, thematic ETFs account for about a third of the industry's revenues, and broad-based ETFs generate two thirds of it (Panel (b)). The disproportionate share of revenues of thematic ETFs is due to the higher fees that they charge on average (Table 1). Over entire sample period, broad-based and thematic ETFs generated cumulative revenues of \$22.6bn and \$14.6bn, respectively.

Panels (c) and (d) present the time series of ETF launches and closures. In the early years, most newly-launched ETFs were broad-based. A large batch of thematic ETFs was launched in 2007, and another on in 2012. The rate of ETF closure is more pronounced for thematic ETFs.

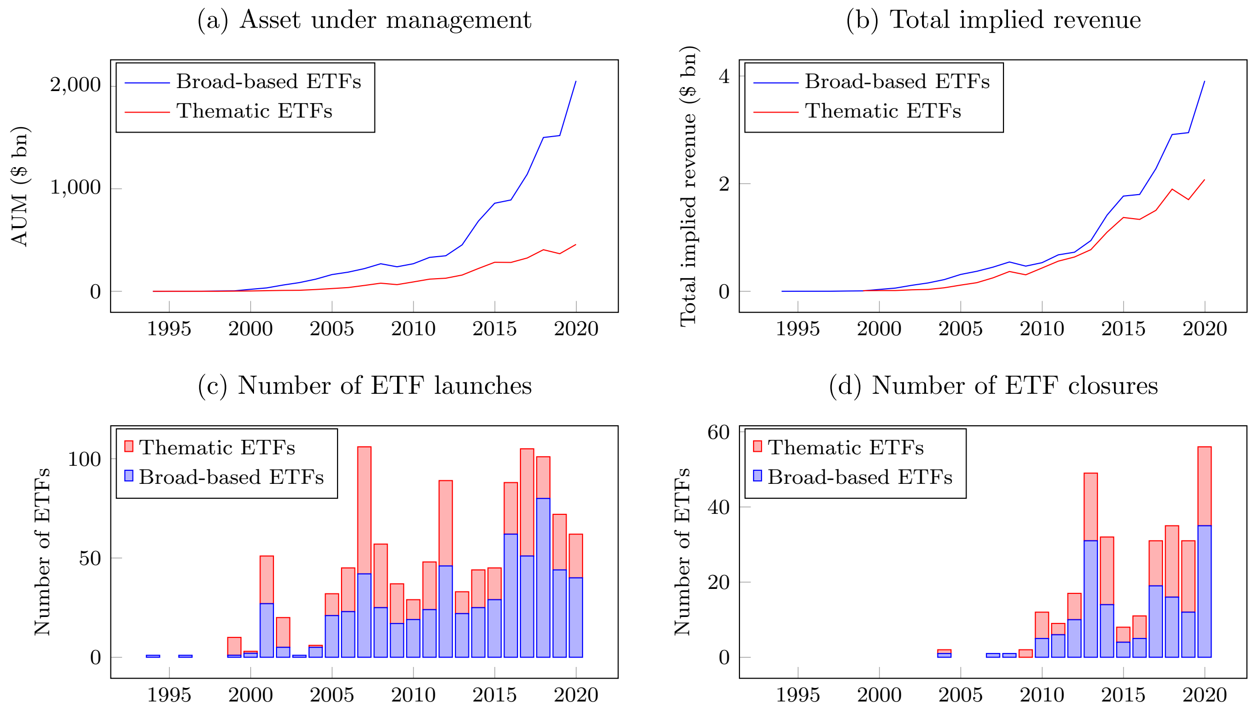
In Table 1 we present summary statistics for our sample of ETFs. Thematic ETFs hold significantly larger portfolios that broad-based ETFs do: the median broad-based ETF contains over 200 stocks while the median thematic ETF holds 50 stocks. Broad-based ETFs charge lower fees than thematic ETFs (compare medians of 37 versus 57 basis points, respectively). These statistics support the conjecture that providers of thematic ETFs compete on quality by providing portfolios that are concentrated in smaller portions of the market, hence more risky, while charging a higher management fee for their service.

Two additional pieces of evidence support the view of a market segmented into price and quality salient equilibria. First, in Figure 3, we plot ETF fees against product differentiation at two points in time: close to the birth of the industry (2002) and towards the end of our sample (2019).[8] We note that broad-based ETFs tend to charge lower fees and to be more similar to one another. Based on the size of circles, which capture ETFs' relative AUM, we can also conclude that there is more concentration in the broad-based segment of the market. This is probably a consequence of price competition leading to a winner-takes-all equilibrium. On the other hand, competition on quality allows differentiated products to gain market share leading to a more equalized distribution of assets in this segment of the

[8]Product differentiation is computed for each category as one minus the cosine similarity between the ETF portfolio weights and the weights of the portfolio of all ETFs in that category that exist in the market at that point in time.

Figure 2. Evolution of the ETF Industry

The figure presents the evolution of the stock-focused ETF industry, split by ETF category. Panel (a) reports aggregate asset under management and Panel (b) shows implied revenue, computed by sum of fee × AUM. Panel (c) presents the number of ETF launches and Panel (d) exhibits the number of ETF closures.



industry.

Figure 3. Segmentation in the ETF Market

The figure presents the evolution of the ETF market in two distinct points in time. Panel (a) shows a snapshot as of December 2002 and Panel (b) shows a snapshot as of December 2019. We calculate cosine similarity between an ETF's portfolio weights around launch and the aggregate portfolio weights of existing ETFs in the same category. Product differentiation is computed as $100 \times (1 - \text{Cosine similarity})$. The panels show the universe of ETFs at each date, by two dimensions: product differentiation and fees. Each bubble represents one ETF, and the size of the bubbles represents relative share of assets under management across all ETFs. Blue bubbles represent broad-based ETFs and red bubbles represent thematic ETFs.

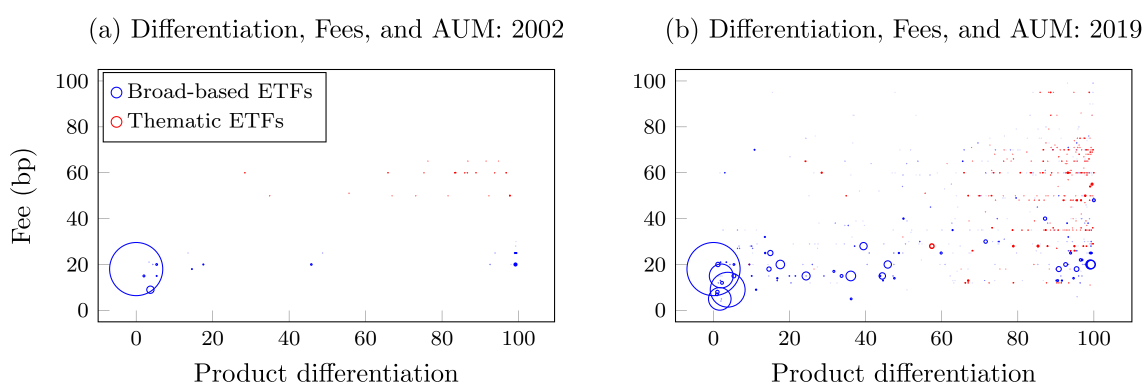


Table 1. ETF Summary Statistics

The table shows summary statistics of ETFs. Panel A reports summary statistics for broad-based ETFs and Panel B reports summary statistics for thematic ETFs. Number of holdings represents the average number of stocks in portfolios of ETFs. Fee refers to annual expense ratio. Turnover is the average daily turnover over the six months since launch. Short interest is the average monthly short interest ratio over the six months since launch. Abnormal return is computed as ETF returns minus contemporaneous CRSP value-weighted market returns over the 60 months since launch. Delisted is an indicator for whether the ETF was liquidated as of the end of 2019. Asset under management (AUM) is the total market value of the investments in 2019. Implied revenue is calculated by multiplying fee by AUM in 2019.

Panel A: Broad-based ETFs								
	N	Mean	SD	p5	p25	p50	p75	p95
Number of holdings (at launch)	611	378	479	34	99	213	470	1,398
Fee (bp)	545	44	26	12	25	37	64	87
Turnover (months 1–6; %)	606	2.82	3.25	0.20	0.93	1.95	3.43	8.66
Short interest (months 1–6; %)	473	4.69	10.60	0.03	0.39	1.11	3.77	23.34
Abnormal return (months 1–60; %)	613	−0.19	0.46	−0.93	−0.34	−0.12	0.04	0.33
Delisted	613	0.27	0.44	0	0	0	1	1
2019 statistics								
Asset under management ($bn)	453	4.53	20.66	0.00	0.05	0.20	1.32	19.77
Implied revenue ($m)	406	9.63	34.66	0.03	0.23	0.94	5.16	49.72
Panel B: Thematic ETFs								
	N	Mean	SD	p5	p25	p50	p75	p95
Number of holdings (at launch)	463	83	85	21	33	50	95	254
Fee (bp)	407	54	20	18	37	57	69	85
Turnover (months 1–6; %)	473	3.95	6.64	0.37	1.11	2.17	4.28	13.20
Short interest (months 1–6; %)	363	7.34	15.88	0.11	0.60	1.66	6.50	33.11
Abnormal return (months 1–60; %)	473	−0.44	1.47	−1.99	−0.69	−0.20	0.24	0.80
Delisted (%)	473	0.30	0.46	0	0	0	1	1
2019 statistics								
Asset under management ($bn)	336	1.36	3.81	0.01	0.04	0.19	0.91	6.81
Implied revenue ($m)	314	6.62	17.53	0.03	0.27	1.05	4.79	27.94

The second piece of evidence provides a consistent view on the product differentiation strategies in the two segments of the market. We use the names of ETFs products to form word clouds, presented in Appendix Figure A.I. These clouds show that names of broad-based ETFs include repeating terms, related to general index names, e.g., S&P 500, Russell 1000, etc. In contrast, the cloud that uses thematic ETF names is composed of many more terms, with lower frequency. It includes industry and thematic words, like healthcare, information, and cannabis.

Another way to demonstrate the segmentation in the ETF market is by studying the product features that attract investor demand. In Table 2, we report estimates from regressions of monthly capital flows into each ETF, a proxy for demand, on product characteristics. In particular, we focus on fees, as a measure of price, and on past returns, which approximate expected returns for investors with extrapolative beliefs and, in this sense, are a measure of quality. The results in the table suggest that investors in broad-based ETFs pay more attention to price than investors in thematic products as their sensitivity to fees is significantly more negative.

Table 2. ETF Flow Sensitivity to Fee and Past Performance

The table presents the flow sensitivity of ETFs to their fee and past performance. The dependent variable is ETF flows in month $t+1$, computed as $100 \times (\text{AUM}_{t+1} - \text{AUM}_t \times \text{ETF return}_{t+1})/\text{AUM}_t$. In each month t, we calculate percentile ranking of ETF returns. Thematic is a dummy variable, taking the value of 1 if an ETF is the thematic ETF. AUM is an ETF's asset under management ($m) in month t and Age is an ETF's age in months. The first three columns report results with panel regressions with year fixed effects. Standard errors are clustered at the ETF and the calendar-month levels. The last three columns report monthly Fama-MacBeth regression results. t-statistics are reported in parentheses.

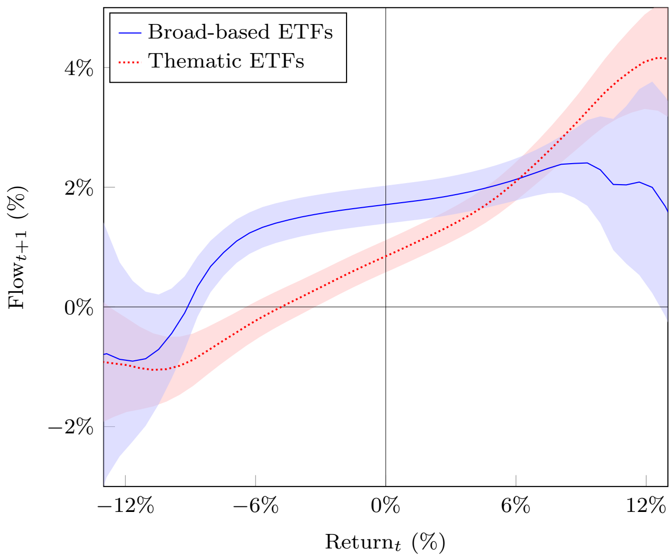
Dependent variable:	Flows$_t$ (%)					
	Panel regression			Fama-MacBeth		
Sample period:	2000–2019	2000–2009	2010–2019	2000–2019	2000–2009	2010–2019
Return ranking$_{t-1}$	0.04***	0.03***	0.04***	0.04**	0.03	0.04***
	(10.01)	(3.72)	(9.55)	(2.30)	(0.94)	(12.54)
Return ranking$_{t-1}$ × Thematic	0.02***	0.02	0.02***	0.00	−0.01	0.01***
	(3.03)	(1.38)	(3.03)	(0.07)	(−0.29)	(2.81)
Fee (bp)	−0.05***	−0.14***	−0.03***	−0.36**	−0.68**	−0.03***
	(−6.50)	(−3.80)	(−6.21)	(−2.46)	(−2.38)	(−6.01)
Fee × Thematic	0.02***	0.04	0.02***	0.33**	0.63**	0.02***
	(2.72)	(1.07)	(2.93)	(2.23)	(2.18)	(2.83)
Thematic	−1.57**	−1.42	−1.69***	−8.49**	−15.63**	−1.29***
	(−2.57)	(−0.60)	(−3.47)	(−2.19)	(−2.04)	(−2.94)
log(AUM$_{t-1}$)	−0.25**	−1.57***	−0.02	−1.43**	−2.90**	0.05
	(−2.54)	(−2.82)	(−0.27)	(−2.41)	(−2.49)	(0.87)
log(Age$_{t-1}$)	−2.07***	−1.44*	−2.19***	−0.07	2.39	−2.54***
	(−11.15)	(−1.90)	(−12.70)	(−0.07)	(1.38)	(−15.72)
Year FE	Yes	Yes	Yes	No	No	No
Observations	81,094	17,907	63,187	81,094	17,907	63,187
Adj R^2	0.045	0.037	0.054	0.130	0.175	0.086

In Figure 4 we examine the flow-performance sensitivity for broad-based and thematic ETFs around launch. We identify new ETFs that have been launched within the previous five years. In each month t, we compute next period flows as $100 \times (\text{AUM}_{t+1} - \text{AUM}_t \times \text{ETF return}_{t+1})/\text{AUM}_t$. Then, We estimate a non-parametric relation between flows and returns using local polynomials.

Both the table and figure show that ETFs investors chase past returns deferentially in broad-based and thematic ETFs. Dannhauser and Pontiff (2019) have document return chasing in ETFs in general, however, here we find that the sensitivity of flows to past returns

Figure 4. Flow-Performance Sensitivity

The figure presents flow-performance sensitivity of ETFs around launch, per ETF category. We identify new ETFs that have been launched within the previous five years. Flows are computed as $100 \times (\text{AUM}_{t+1} - \text{AUM}_t \times \text{ETF return}_{t+1})/\text{AUM}_t$. Returns are ETF returns minus CRSP value-weighted returns. We estimate a non-parametric relation between flows and returns using local polynomials. The shaded areas represent 95% confidence intervals.



is significantly higher for thematic ETFs, consistent with more attention to quality in this segment of the market.

The greater variety in themes in the thematic segment of the ETF industry reflects the heterogeneity in investors' interests. The fact that thematic ETFs can charge higher fees allows niche ETFs to appeal to smaller crowds. This assertion is confirmed by the distribution of estimated annual reviews (fees times average AUM), in Table 1. The table shows that the distribution of revenues generated by broad-based ETFs largely matches that of thematic ETFs. For example, for both types of ETFs, the median revenue is about \$0.7m and 75$^{\text{th}}$ percentile revenues is just above \$3m for both groups. The main difference between the groups is in the extreme right tail, where the large broad-based ETFs (like State Street's SPDR tracking the S&P 500 index) pull higher revenues due to their sheer size.

5 The "Quality" of Thematic ETFs

Understanding the ETF market structure requires understanding the drivers of demand for ETFs. As discussed earlier, it seems uncontroversial that broad-based ETFs offer diversification at a low cost. For instance, instead of trading the 500 individual stocks that belong to the S&P 500, an investor could trade a single ETF tracking the index. Broad-based ETFs, therefore, reduce transaction costs and help investors acquire a diversified portfolio.

In contrast to the clear value created by broad-based ETFs, the case for value creation by thematic ETFs is less obvious. Given the high fees that investors are willing to pay to invest in these products, the first conjecture that we make is that investors are rational and that they benefit from investing in thematic ETFs along some dimension.

The first possibility that we entertain is that thematic ETFs deliver superior performance. Under this conjecture, the rationale for investing in high-fee ETFs is simply to achieve positive risk-adjusted returns (i.e., alpha). Thematic ETFs, therefore, provide a low-cost tool for accessing these investment ideas.

The second possibility is that thematic ETFs create value by providing hedging against some risks which investors care about. In other words, these products operate like an insurance policy. For this reason, their risk adjusted performance does not have to be positive, to the extent that it negatively correlates with some risk factor that is of hedging concern to investors.

Thus, the first test that discriminates between the two conjectures relies on measuring the risk adjusted performance of thematic ETFs. We do that in the next subsection.

5.1 The Performance of Thematic ETFs

To measure the performance of thematic ETFs, we use a standard approach in the asset pricing literature. We form a monthly portfolio that holds all the available ETFs in the market. We separately consider the universes of broad-based and thematic products. The portfolios are reformed each month and are either equally- or market-capitalization-weighted. Then, we run regressions of the returns[9] of these portfolios in excess of the risk free rate on commonly-used risk factors,[10] as is customary in the asset pricing literature.

In Table 3, we present the intercept from these regressions, which reflects the risk-adjusted performance of the portfolios, and is commonly labeled 'alpha.' The table shows that thematic ETFs persistently generate negative alpha of about -3% per year for Fama-French-Carhart 4 factors (i.e., $-0.26\% \times 12$). Underperformance is closer to zero (but still negative) when using more elaborate factor models. The underperformance cannot be attributed to the high fees (0.54% on average; see Table 1). In comparison, broad-based ETFs generate negative alpha of about -0.72% a year, using the same risk model, which is closer to the fees they charge.

[9] ETF returns are net of fees.

[10] Risk factors returns are downloaded from Professor French's website: `https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html` and Professors Hou, Xue, and Zhang's website: `http://global-q.org/factors.html`.

Table 3. Calendar-Time Portfolios of ETFs

The table presents risk-adjusted performance of ETFs from 2000 to 2019. In Panel (A), we form portfolios consisting of all ETFs in the same category. In Panel (B), we identify new ETFs that have been launched within the previous five years in each month, per ETF category. Then we form portfolios consisting of all new ETFs in the same category. In Panel (C), we identify old ETFs that have been launched more than five years ago in each month, per ETF category. Then we form portfolios consisting of all old ETFs in the same category. The portfolio returns are value-weighted using one-month-lagged market capitalization as weights. Excess return refers to average monthly return in excess of risk-free rate. CAPM, FF3, FFC4, FF5, FFC6, and Q denote alphas with respect to CAPM, Fama-French 3-factor model, Fama-French-Carhart 4-factor model, Fama-French 5-factor model, Fama-French-Carhart 6-factor model, and Q-factor model respectively. The remaining columns report alphas using various asset pricing models. The portfolios of all broad-based (thematic) ETFs include 182 (180) ETFs on average. TH minus BB denotes thematic ETF portfolio minus broad-based ETFs portfolio. The alphas are in percentage points and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Excess return	CAPM	FF3	FFC4	FF5	FFC6	Q
Panel A: All Months							
Broad−Based ETFs	0.62**	−0.08**	−0.07**	−0.06*	−0.02	−0.02	−0.02
	(2.20)	(−2.29)	(−2.22)	(−1.83)	(−0.70)	(−0.55)	(−0.47)
Thematic ETFs	0.42	−0.26***	−0.27***	−0.26***	−0.16*	−0.15*	−0.14
	(1.41)	(−3.19)	(−3.27)	(−3.09)	(−1.85)	(−1.81)	(−1.65)
TH minus BB	−0.18**	−0.19***	−0.20***	−0.20***	−0.14*	−0.14*	−0.13*
	(−2.33)	(−2.67)	(−2.74)	(−2.71)	(−1.81)	(−1.82)	(−1.69)
Panel B: Months ≤ 60							
	Excess return	CAPM	FF3	FFC4	FF5	FFC6	Q
Broad−Based ETFs	0.44	−0.19**	−0.19**	−0.14	0.02	0.03	−0.00
	(1.49)	(−2.04)	(−2.02)	(−1.59)	(0.23)	(0.40)	(−0.01)
Thematic ETFs	0.10	−0.51***	−0.52***	−0.50***	−0.36**	−0.36**	−0.34**
	(0.28)	(−3.75)	(−3.85)	(−3.61)	(−2.49)	(−2.47)	(−2.40)
TH minus BB	−0.25	−0.32**	−0.32**	−0.35**	−0.42**	−0.43**	−0.37**
	(−1.64)	(−2.05)	(−2.07)	(−2.19)	(−2.48)	(−2.50)	(−2.21)
Panel C: Months > 60							
	Excess return	CAPM	FF3	FFC4	FF5	FFC6	Q
Broad−Based ETFs	0.79***	−0.04*	−0.03	−0.03	−0.06***	−0.06**	−0.05*
	(2.79)	(−1.67)	(−1.26)	(−1.19)	(−2.66)	(−2.58)	(−1.96)
Thematic ETFs	0.67**	−0.17**	−0.17**	−0.17**	−0.16*	−0.16*	−0.12
	(2.32)	(−2.14)	(−2.15)	(−2.12)	(−1.91)	(−1.88)	(−1.41)
TH minus BB	−0.08	−0.12*	−0.14**	−0.14*	−0.11	−0.11	−0.08
	(−1.14)	(−1.75)	(−2.01)	(−1.97)	(−1.53)	(−1.49)	(−1.11)

To summarize, this analysis suggests that thematic ETFs do not create value for their investors by providing outperforming investment strategies. Hence, the high fees and lack of diversification of these products remain a puzzle. For this reason, we entertain more closely the hypothesis that thematic ETFs provide insurance against some risk factors.

5.2 Hedging Properties of Thematic ETFs

Our results suggest that thematic ETFs deliver negative risk-adjusted performance, on average. To explain investors' demand for these products in spite of their underperformance, we conjecture that thematic ETFs deliver value as a form of insurance. In the asset-pricing language, it is possible that our earlier tests fail to capture some unobserved risk factor that rational investors care about. Thematic ETFs might be the right vehicle that allows these investors to hedge against this unobserved risk factor. For this reason, investors are willing to accept lower returns.

The implication of this conjecture is that the performance of thematic ETFs has a negative correlation with a portfolio of assets that rational investors dislike, i.e., a portfolio that pays a positive risk premium. To test this prediction, we construct a portfolio of stocks that have negative correlation with the portfolio of all thematic ETFs. In more detail, every month, we sort stocks based on their beta on the excess return of the market-capitalization-weighted portfolio of thematic ETFs. The beta is estimated using 60-month-rolling-window regressions, requiring each stock to have at least 36 months observations with returns. Then, we form five portfolios corresponding to the quintiles of the estimated betas. Portfolio 1 (5) has the stocks with the lowest (highest) correlation with the thematic portfolio.

Table 4 reports the alphas from regressions of these portfolios' returns on different factor models. We also report the estimates of alpha for the portfolio that is long low-thematic-beta and short high-thematic-beta stocks (i.e., quintiles 1 minus 5), which mimics the factor for which thematic ETFs should provide insurance.

In no specification are the alphas of low-thematic-beta stocks consistent with a positive risk premium. In particular, the long-short portfolio delivers insignificant alphas. This evidence, therefore, does not support the conjecture that thematic ETFs provide hedging for an underlying risk factor.

Another way to investigate whether investors hold thematic ETFs for hedging purposes is to study investors' loyalty to these products as they experience negative performance. Specifically, if the negative performance of thematic ETFs reflects an insurance premium, investors should not be disappointed, and they should stick with them in spite of the low returns.

To shed light on investor behavior, in Table 5, we study investor capital flows over the life of an ETF. We ask whether investors' likelihood to put new money into thematic ETFs changes over the life cycle of the product. Because there can be life-cycle patterns in flows that do not depend on the performance of the product, we benchmark thematic products to the broad-based ones. The estimates suggest that investors are very enthusiastic about thematic ETFs at their inception, as they are more likely to put money in these products

Table 4. Hedging Motive

The table presents risk-adjusted monthly performance of stocks from 2000 to 2019, per loading on the thematic ETFs portfolio returns. In each month, we sort stocks based on their beta on the excess return of the market-capitalization-weighted portfolio of thematic ETFs. The beta is estimated using 60-month-rolling-window regressions, requiring each stock to have at least 36 months observations with returns. Then, we form five portfolios corresponding to the quintiles of the estimated betas. Portfolio Q1 (Q5) has the stocks with the lowest (highest) correlation with the thematic portfolio. The alphas are in percentage points and t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Exposure to thematic ETFs:	Low	Q2	Q3	Q4	High	Q5−Q1
CAPM alpha	-0.04	0.02	0.13**	-0.07	-0.32	-0.28
	(-0.24)	(0.31)	(2.00)	(-0.81)	(-1.48)	(-0.80)
FF3 alpha	0.06	0.03	0.11*	-0.09	-0.34*	-0.40
	(0.47)	(0.40)	(1.68)	(-1.07)	(-1.67)	(-1.37)
FFC4 alpha	0.07	0.03	0.11	-0.09	-0.35*	-0.42
	(0.53)	(0.49)	(1.65)	(-1.05)	(-1.72)	(-1.43)
FF5 alpha	0.14	0.01	0.08	-0.03	-0.25	-0.39
	(1.08)	(0.11)	(1.24)	(-0.43)	(-1.28)	(-1.38)
FF6 alpha	0.15	0.01	0.08	-0.03	-0.26	-0.41
	(1.10)	(0.18)	(1.24)	(-0.41)	(-1.31)	(-1.42)
Q alpha	0.02	0.02	0.10	-0.06	-0.24	-0.27
	(0.13)	(0.21)	(1.54)	(-0.67)	(-1.11)	(-0.75)

than in broad-based ones in the early stages of their life cycle (i.e., the positive slope on the thematic dummy). However, as time passes, investors are also more likely to lose affection for thematic products (i.e., the negative slope on the interaction between age and the thematic dummy). This disenchantment manifests itself soon enough after the inception of the ETFs, as suggested by the estimates in the second column, where we condition on less-than-five-year-old ETFs. We interpret these results as suggestive of investor disappointment following the poor performance of thematic products.

Overall, the evidence in this subsection does not support the conjecture that investors purchase thematic ETFs for insurance purposes. We, therefore, turn to a different hypothesis to explain the demand for thematic products. The results in Table 5 reveal that these products attract a lot of investor interest around their inception. This finding may indicate that they are launched at times of positive investor sentiment for a specific investment style. Therefore, in the next section, we investigate the hypothesis that the issuance of thematic ETFs responds to the demand for trendy investment themes.

Table 5. Disappointment in Flows

The table presents flow dynamics of ETFs since launch, per ETF category. The dependent variable is a dummy variable, taking the value of 1 if a flow is positive. ETF flows in month $t+1$ are defined as $100 \times (\text{AUM}_{t+1} - \text{AUM}_t \times \text{ETF return}_{t+1})/\text{AUM}_t$. Thematic is a dummy variable, taking the value of 1 if an ETF is the thematic ETF. log(Age) is the ETF's logged age (in months). The first column reports results using the full sample from 2000 to 2019 and the second column reports results with new ETFs that have been launched in the previous five years. Standard errors are clustered at the ETF and the calendar-month levels and t-statistics are reported in parentheses.

Dependent variable:	Positive flow dummy	
Sample:	Full Sample	Age $\leq$ 60 months
Thematic	0.08***	0.06***
	(3.73)	(2.66)
log(Age)	−0.06***	−0.05***
	(−10.71)	(−9.09)
Thematic × log(Age)	−0.03***	−0.03***
	(−5.96)	(−3.85)
Year FE	Yes	Yes
Observations	86,715	46,612
R^2	0.040	0.023

6 Do Thematic ETFs Cater to Investor Sentiment?

The hypothesis that we test in this section is that thematic ETFs are launched in response to investors' demand that is driven by sentiment as opposed to rational expectations. In other words, some investors have demand for securities in trendy industries or themes. ETF providers identify the current popular trends in the market and design ETF portfolios that satisfy this demand. A similar pattern was documented in the mutual fund industry, in which funds changed their names in order to attract sentiment-driven flows in the late 1990s (Cooper et al., 2005).

Several predictions arise from this conjecture. First, if thematic ETFs ride recent trends, then the securities that they hold in their portfolios should (*i*) have attracted investors' attention and (*ii*) display traits of overvaluation (indicative of positive sentiment). Second, since this overvaluation should at some point revert, thematic ETFs should have disappointing performance after their launch. Finally, investors in thematic ETFs are likely to be unsophisticated and sentiment-prone.

In what follows, we test these predictions.

6.1 Characteristics of the Holdings of Thematic ETFs

To understand whether the launch of ETFs caters to investor sentiment, we analyze the characteristics of the stocks in the ETF portfolios at the time of the launch for thematic and broad-based products. We focus on several characteristics that could imply heightened investor attention and overvaluation.

For each stock in an ETF portfolio, we measure a relevant characteristic in the two-year period before the launch. Then, we compute the value-weighted average characteristic at the ETF level at the time of launch. Table 6 compares the average ETF-level characteristic for thematic and broad-based portfolios.

The table shows that stocks included in the portfolios of thematic ETFs were recently under the spotlight. Relative to broad-based portfolios, stocks in thematic ETFs experienced higher past market-adjusted returns, higher media exposure, with positive sentiment, and larger earnings surprises. Overall, thematic stocks experience more positive market sentiment before the launch of the ETF.

Incidentally, we note that also the stocks in broad-based products experience positive pre-launch returns. This finding raises the possibilities that the sets of broad-based and thematic products are not entirely disjoint or, more likely, that the product classification into broad-based and thematic ETFs is necessarily an approximation.[11]

The fact that stocks in thematic ETFs display high past returns makes them attractive to unsophisticated investors with extrapolative believes (Greenwood and Shleifer, 2014; Barberis et al., 2018). Moreover, thematic stocks display more positive skewness, which is appealing for investors who have preference for gambling (Brunnermeier and Parker, 2005; Brunnermeier et al., 2007; Mitton and Vorkink, 2007; Barberis and Huang, 2008; Kumar, 2009).

Table 6 also suggests that thematic ETFs hold glamour stocks that are likely to be overvalued (Lakonishok, Shleifer, and Vishny, 1994). Specifically, stocks in thematic ETFs have a high market-to-book ratio and high short interest. These characteristics are typically associated with lower future returns (Daniel and Titman, 1997; Boehmer, Jones, and Zhang, 2008; Ben-David, Drake, and Roulstone, 2015).

Overall, the characteristics of the securities included in the portfolios of thematic ETFs indicate that they are 'hot' stocks. This evidence is also consistent with a causal observation of ETF launches in recent times. In 2019, for example, the new ETFs included products

[11] For example, smart beta ETFs are classified as broad-based since they do not have a theme- or a sector-focus. These ETFs hold, on average, stock that outperformed in the pre-launch period. Going forward, these funds generate zero alpha. See an analysis of the performance of smart beta stocks in (Huang, Song, and Xiang, 2020).

focusing on cannabis, cyber security, and video games. In 2020, new thematic ETFs covered stocks related to the Black Lives Matter movement, COVID-19 vaccine, and the work-from-home trend.

Table 6. Portfolio Characteristics of ETFs Around Launch

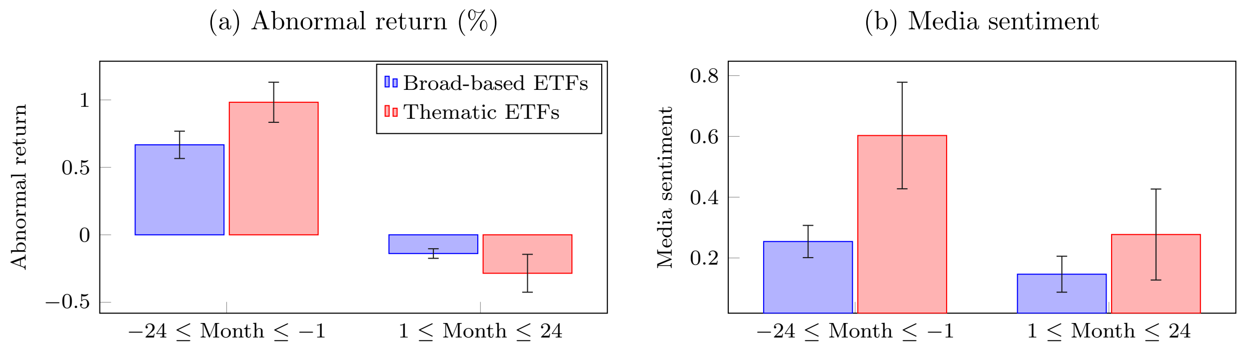
The table shows portfolio characteristics of ETFs prior to their launch dates. For each characteristic of interest, we construct an ETF-month-level time series of the characteristic from month -24 to month -6 using an ETF's initial portfolio weights in the launch month 0. Then we calculate the average of the characteristic across all ETFs in the same category. We report mean and t-test results. Abnormal return represents returns in excess of CRSP value-weighted market returns. Return skewness is the skewness of monthly returns following Ghysels et al. (2016). We use the 25^{th} and 75^{th} percentiles as cutoffs. Media exposure is the number of monthly news articles scaled by market capitalization. Media sentiment is the sum of composite sentiment scores from the RavenPack scaled by market capitalization. Regarding the two media-related variables, we subtract the median in each month to purge out time components. Earning surprise denotes average EPS surprise scaled by one-quarter-lagged stock price. In each year, we standardize the earning surprise variable. Market-to-book is market equity divided by book equity. Short interest is the monthly short interest ratio. We subtract median of the short interest ratio in each month to purge out time components. t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Broad-based ETFs	Thematic ETFs	Difference
Abnormal return	0.67	1.08	0.41***
	(7.19)	(5.67)	(4.27)
Return skewness	0.02	0.17	0.14***
	(0.35)	(3.08)	(3.62)
Media exposure	−0.05	30.73	30.79***
	(−0.02)	(2.82)	(3.42)
Media sentiment	0.26	0.62	0.36***
	(4.25)	(3.40)	(3.32)
Earning surprise	0.02	0.03	0.01***
	(4.59)	(7.29)	(2.79)
Market-to-book	1.93	2.04	0.11**
	(25.27)	(20.08)	(2.20)
Short interest (%)	0.02	0.03	0.01**
	(20.63)	(14.77)	(3.71)

Further evidence of excessive optimism around thematic stocks comes from Figure 5. We find that thematic stocks enjoy more positive media sentiment (Panel A), consistent with Table 6, and positive earnings surprises (Panel B), which are also likely to feed positive investor sentiment. Second, the figure shows that the positive sentiment around thematic stocks quickly reverts in the year after launch. This quick reversal of the initial hype suggests that the underperformance that we observe for thematic ETFs should materialize soon after the launch. In what follows, we study this conjecture.

Figure 5. Dynamics of ETF Portfolio Characteristics

The figure presents characteristics dynamics of ETFs, per ETF category. Panel (a) reports the dynamics of media sentiment and Panel (b) reports the dynamics of earning surprise. For each characteristic of interest, we construct an ETF-month-level time series of the characteristic from month −24 to month 24 using an ETF's portfolio weights. In the pre-launch periods, we use the ETF's initial portfolio weights in the launch month 0. In the post-launch periods, we use one-month-lagged portfolio weights. Then we calculate the average of the characteristic across all ETFs before and after launch, per ETF category. Bar charts represent average characteristics and error bars represent 1.96 standard error confidence intervals.



6.2 Performance After Launch

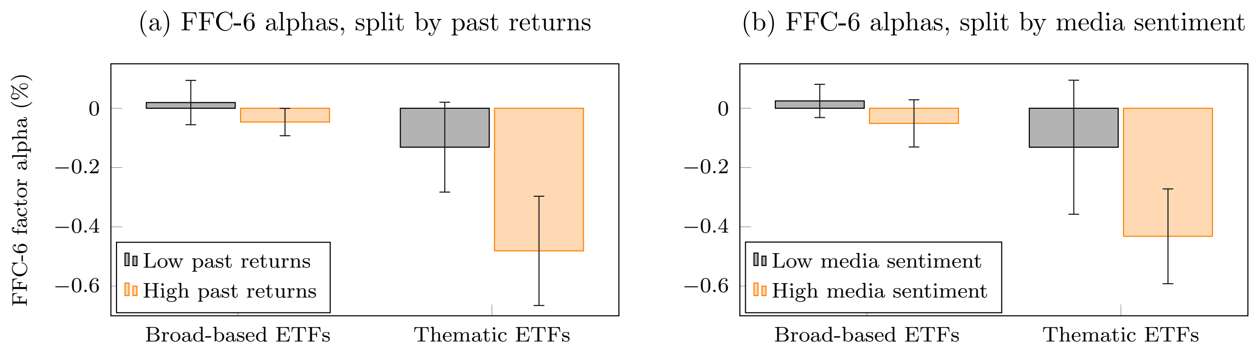
To investigate the performance dynamics of broad-based and thematic ETFs, we focus on the first five years after launch. As in subsection 5.1, we use the calendar-time portfolio approach and estimate risk-adjusted returns (alphas). In greater detail, we form calendar time portfolios that hold all the ETFs in each of the two categories that were launched in the prior five years. Each month, new ETFs that are just launched enter the portfolio and ETFs that are delisted or were launched earlier than five years are removed from the portfolio. The ETFs in the portfolios are weighted by their lagged AUMs.

Table 3 reports the estimates. Similar to our previous findings, Panel A of Table 3 shows that thematic ETFs display negative risk-adjusted performance. Moreover, the performance of thematic ETFs is significantly lower than that of broad-based products. Importantly, the new evidence is that this underperformance is concentrated in the five-year period after launch. For completeness, Panel B shows that, after the first five years, the risk-adjusted performance, while still negative, is substantially closer to zero.

Figure 1 in the Introduction provides a graphical description of this evidence. In this setting, each point in the chart is produced by one regression. The alpha associated with month one, for example, is produced from a regression on the performance of a portfolio that includes all the ETFs existed for only one month; the alpha associated with month two, is produced by a portfolio that includes ETFs that have two-month life; we repeat the process

Figure 6. Performance of ETFs, Split by Pre-launch Stock Characteristics

The figure presents Fama-French-Carhart 6 factor model (FFC-6) alphas of the portfolios of ETFs from 2000 to 2019, split by ETF categories and stock characteristics groups. In Panel (a), we split each ETF category into two groups by past abnormal returns and in Panel (b) we split each ETF category into two groups by past media sentiment as in Table 6. For each month, we identify new ETFs that have been launched within the previous five years, per ETF category and stock characteristic group. Then we form a portfolio consisting of all new ETF in the same category. The portfolio returns are value-weighted using one-month-lagged market capitalization as weights. To adjust returns for risk factors, we estimate Fama-French-Carhart 6 factor model (FFC-6) alphas of the portfolios using squared roots of the number of ETFs in each portfolio-month as weights. The alphas are in percentage points. Error bars represent 1.96 standard error confidence intervals.



up to the 60-month-life span.[12]

Using a similar approach, we can support the claim that the characteristics in Table 6 capture overvaluation of thematic ETFs. Specifically, in Figure 6, we further split ETFs based on whether the average characteristic in the portfolio is above or below the median. The figure shows that portfolios of the thematic ETFs scoring high on the metrics of investor attention and sentiment display more negative performance after launch.

Overall, our results show that thematic ETFs start underperforming right after launch. Given that the pre-launch performance of the underlying portfolios of these ETFs as well as the attention that they attract are high, the negative post-launch alpha suggests that the launch of thematic ETFs occurs near the peak of valuation for the underlying securities. In order words, it appears that ETF providers cater to sentiment-driven demand for investment themes.

6.3 Who Invests in Thematic ETFs?

To bring further evidence that ETF providers cater to unsophisticated investors, in the last part of our analysis, we study the investor clienteles in the two categories of ETFs. We

[12]We also verify that our results are not driven by ETFs that hold foreign stocks. In Appendix Table A.I, we restrict the sample of thematic ETFs to those that includes at least 80% of their market cap invested in stocks traded in the U.S. The results of the analysis are similar to those reported in Figure 1.

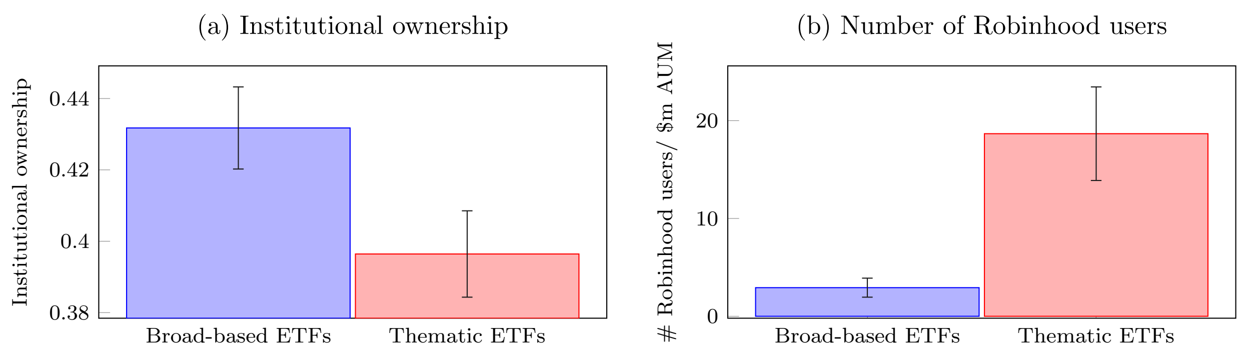
focus on the period right after the launch of the products, as these early investors are the likely targets of ETF providers.

We start from using regulatory filings by institutional investors. In particular, the SEC 13F form reports the institutional owners of an ETF.[13] Institutional investors include mutual funds, hedge funds, pension funds, banks, insurance companies, endowments, etc. Our working assumption is that institutions are on average more sophisticated than retail investors, i.e., their investment decision are less prone to systematic biases (e.g., French, 2008; Stambaugh, 2014).

Figure 7, Panel (a), reports the average fraction of shares owned by institutional investors in the first four quarters since launch. The panel shows that institutions own about 43% of the market capitalization of broad-based ETFs in their first year. In contrast, institutions own a significantly lower share of the market capitalization of thematic ETFs at about 0.39%. Since shares not owned by 13F-reporting institutions are either owned by smaller (non-reporting) institutions or retail investors, we deduct that retail investors are likely to own a greater share of the thematic ETFs universe than that of broad-based ETFs universe, supporting the view that unsophisticated investors are more likely to populate the clientele of thematic ETFs.

Figure 7. ETF Ownership Around Launch

The figure presents ownership structures of ETFs around launch, per ETF category. During the first year since launch, we calculate average ownership of 13F institutional investors and number of Robinhood users scaled by asset under management ($m). Panel (a) reports 13F ownership and Panel (b) reports number of Robinhood users per AUM. Bar charts represent average ownership and error bars represent 1.96 standard error confidence intervals.



We can also gain direct insights on ownership by retail investors through user data from the discount brokerage Robinhood. This data is available starting in 2018 and it reports the number of Robinhood users holding each security. The Robinhood platform has recently

[13]Only institutions that manage more than $100,000 in U.S. equity are required to file a 13F form. The filers need to report positions exceeding $200,000 or 10,000 shares.

become popular for being the habitat of retail investors who are arguably sentiment-driven.[14] Panel (b) of Figure 7 shows that the number of users scaled by the ETF market capitalization is substantially higher for thematic ETFs than for the broad-based ones in their first year of existence.

The interest of Robinhood traders in thematic ETFs is consistent with the observations of Barber, Huang, Odean, and Schwarz (2020) and Welch (2020), who document that Robinhood investors hold attention-grabbing securities. Barber et al. (2020) show that Robinhood traders experience negative returns shortly after they enter their positions.[15]

Indeed, examining the holdings of Robinhood users around the launch of ETFs corroborates the earlier conclusions of Welch (2020) and further provide support for the hypothesis that thematic ETFs are launched in trendy segments of the market. In Figure 8, we plot the underlying stock holdings by Robinhood users in an event study around ETF launches. Specifically, we compute the number of users holding the stocks that will be included in the ETF (to be launched in month 0), weighted by their weight in the ETF. Since Robinhood user base increased significantly over the sample period, we subtract the median stock holding of the relevant calendar month.[16] We repeat a similar analysis for the number of users holding ETFs.

The results in Panel (a) of Figure 8 show that the number of users holding the stocks that will be included in future thematic ETFs increase and peak right before the launch. Around the launch time, the number of users starts declining. We observe no similar pattern for broad-based ETFs. These results reiterate the point made in Section 6.1, that thematic ETFs are launched in segments of the market that sentiment-driven investors are excited about, however, they seem to be arriving after the peak in excitement has been achieved.[17]

Once new thematic ETFs are launched, they attract some of the Robinhood traders, however, not at the same rate as the underlying stocks do. Those that are drawn to new thematic ETFs lose their interest after a few months since launch. Broad-based ETFs do not exhibit these patterns.

Another way to learn about the degree of sophistication of the clienteles of broad-based

[14]See `https://www.nytimes.com/2020/07/08/technology/robinhood-risky-trading.html`.

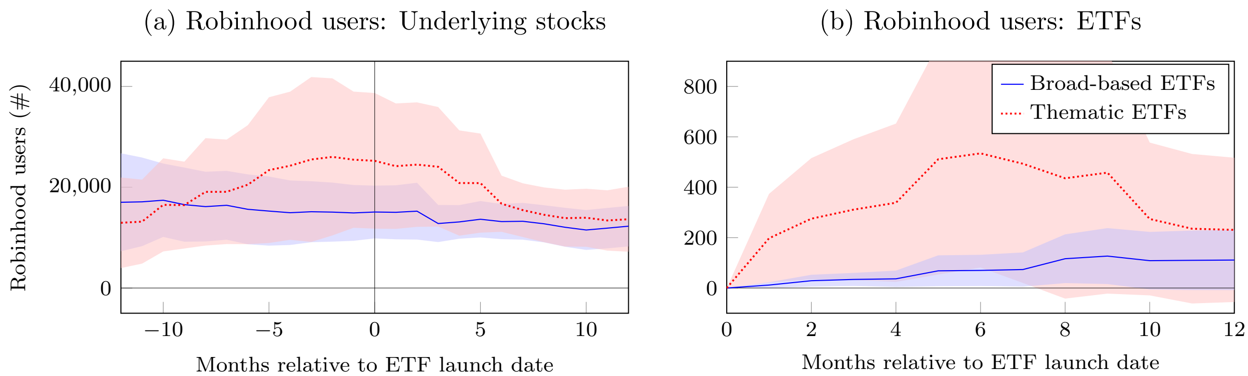
[15]Welch (2020) also finds that Robinhood traders' strategy, which is concentrated on high-volume and large stocks, delivers a positive alpha over the 1980–2020 period. This evidence, arising from trades in *stocks*, does not contradicts our results showing that *thematic ETFs*, that are favored by Robinhood traders, deliver a negative alpha.

[16]Due to the skewness of the holdings data, adjusting user holdings by the mean results in very high cross-sectional variance in some months. Adjusting by the median produces more stable estimates.

[17]Part of the delay may come from the time it takes for the issuers to detect the a potentially-exciting trend and part of it may come from the time the financial and legal process is accomplished. In addition, the Securities and Exchange Commission (SEC) requires a "quiet period" of 75 days for new ETF proposals in which the commission reviews the proposal.

Figure 8. ETF Ownership Around Launch

The figure presents the number of Robinhood users around launch, per ETF category. We subtract the median of the Robinhood users in each month to purge out time components. In Panel (a), we construct an ETF-month-level time series of the Robinhood users, who hold underlying stocks, from month −18 to month 18 using an ETF's portfolio weights. Prior to launch, we use the portfolio weights in the launch month 0. Then, we calculate the average of the Robinhood users across all ETFs in the same category. In Panel (b) we compute the average of Robinhood users, who hold ETFs, across all ETFs in the same category. The shaded areas represent 95% confidence intervals.



and thematic ETFs is to study their demand for these securities in response to past performance. It has been documented that investors in ETFs chase past performance (Dannhauser and Pontiff, 2019). Here we find that this tendency is far stronger in thematic ETFs than in broad-based ETFs (see Figure 4 shown earlier). This empirical pattern is consistent with positive feedback trading (De Long et al., 1990), and further suggests that investors in thematic ETFs are less sophisticated than those in broad-based ETFs. While this behavior could make sense in actively-managed funds, in which investors can learn about the ability of managers from their past performance (a la Berk and Green, 2004), it is likely inconsistent with rationality when it comes to passive investment vehicles, such as ETFs. Indeed, Ben-David, Franzoni, and Moussawi (2018) and Brown, Davies, and Ringgenberg (2020) find that high flows into ETFs are followed by negative returns.

The narrative that emerges from the results in this section is that thematic ETFs cater to sentiment-driven retail investors with trendy investment themes. These portfolios include attention-grabbing stocks that are overvalued at the time of launch. In the years following the launch, the value of thematic ETFs declines drastically.

7 Conclusion

This paper studies the most prominent wave of financial innovation in the last thirty years, i.e., the explosion of Exchange Traded Funds (ETFs). Many observers view the proliferation of ETFs as a positive development that allows ordinary investors to achieve diversification at low cost and to construct payoff profiles that would otherwise be unattainable.

We argue that the lens through which one ought to interpret the ETF market is the model by Bordalo et al. (2016), which argues that producers can compete along either the price ('Walmart') or the quality ('Starbucks') dimensions of a product. In this spirit, two equilibria prevail in the ETF market corresponding to two types of products. Broad-based ETFs hold diversified portfolios and charge low fees. These products appeal to investors seeking a low-cost vehicle to invest in diversified portfolios. Thematic ETFs, in contrast, offer investors exposure to trendy themes at a high cost and low level of diversification. The average AUM of these funds is smaller, on average, however, in aggregate they driven about a third of the revenues of the equity-based ETF industry.

While broad-based ETFs clearly achieve their goal to provide diversification at low cost, we ask whether thematic products provide value in terms of insurance and/or exposure to successful investment ideas. Our results suggest that thematic ETFs fail to create value for investors. These ETFs tend to hold attention-grabbing and overvalued stocks and therefore underperform significantly: they deliver a negative alpha of about -4% a year. This underperformance persists for at least five years since launch. We find no evidence that the negative performance corresponds to the price that investors are willing pay to insure against some relevant risk factor. Instead, our evidence suggest that thematic ETFs are launched just of the very peak of excitement around an investment theme.

We conclude that the implications of the 'democratization of investment,' which ETFs bring about, are mixed. On the one hand, investors can now access financial markets at low cost, which can be welfare improving because it allows broader risk sharing. On the other hand, the marketing strategies of thematic ETFs attract unsophisticated investors towards underperforming investment propositions. It is possible that, absent thematic ETFs, these investors would still invest their money inefficiently. However, thematic ETFs could encourage greater participation due to their marketing efforts. Investors on the extensive margin may be worse off due to holding thematic ETFs.

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Appendix A A Primer on ETFs

Exchange-traded products (ETPs) are investment companies whose objective is to replicate the performance of an index, in a similar manner to index mutual funds. Unlike index funds, however, ETPs are listed on an exchange and are traded throughout the day. These funds are organized in several legal structures, such as exchange-traded funds (ETFs), exchange-traded notes (ETNs), exchange-traded commodities, and Index Participation Unit (IPU). In this article, we focus exclusively on ETFs.

The first U.S. ETF was launched in January 1993. It tracked the S&P 500 (ticker: SPY). SPY is currently the largest ETF in the world, with nearly $300 billion in assets. As of the end of 2019, the number of ETFs has grown to over 3,000 in the U.S. and nearly 7,000 globally, with these products spanning various asset classes.

ETFs can generate the performance of the relevant index in two alternative ways. First, they can hold a basket of securities that, more or less, replicates the index ("physical replication"). Second, they can enter into swap agreements with financial institutions to have the performance of the index delivered by these counterparties in exchange for a fee ("synthetic replication"). The physical structure is prevalent in the U.S. and it characterizes all the ETFs in our sample.

The focus in this article is on "plain vanillia" equity ETFs that hold portfolios of stocks that track an index. The index can be a previously-used index, such as the S&P 500 or Russell 2000, or an index that is designed by the issuers expressly for the ETF, e.g., the index tracked by the work-from-home ETF, launched in June 2020.

The innovation in the ETF structure revolves around the creation and redemption mechanism that takes place on a daily basis and keeps the market price of the ETF in close proximity to the value of the basket of securities in the index that they track. Since ETFs hold securities that are traded themselves on the market, there is a possibility of temporary misalignment between the price of ETF shares and the value of the basket of securities. For example, when there is high demand for the ETF, but not yet for the underlying securities, the ETF will trade at a premium relative to the underlying index. To ensure that significant deviations are not created between the ETF and the underlying securities portfolio, ETFs continuously issue new shares when investors' demand is high or redeem shares when investors' demand is low. The creation or redemption of ETF shares is called *flows*, which can be positive or negative, and could serve as an indication for the demand for the ETF in excess of the demand for the underlying securities.

For further reading about ETFs, please see Ben-David, Franzoni, and Moussawi (2017) and Ben-David et al. (2018).

Appendix B Data Sources

B.1 ETF Data

We use information from the Center for Research in Security Prices (CRSP) to identify a comprehensive and survivorship-bias-free list of all U.S. equity ETFs. We first select securities with share code of 73 from CRSP, or a non-missing ETF Flag in the CRSP Mutual

Fund Database. Since we are interested in ETFs that hold U.S. equities only, we drop ETFs focusing on the bond market (have CRSP style of fixed income, mixed holdings, or other—style codes: I, M, O, or name contains "bond"). We also drop inverse and leveraged ETFs (having Lipper classification code of DSB,[18] or CRSP style codes of EDYS or EDYH,[19] or name contains: 2×, 3×, bear, or bull). We exclude ETFs that are classified as foreign equity ETFs (CRSP style code of F). The final sample contains 1,086 distinct U.S. equity ETFs which satisfy all requirements.

CRSP is our primary source for daily volume and shares outstanding as of the end of the trading day. Furthermore, we use CRSP's end-of-month information about returns, prices, and supplement it with Bloomberg's and Compustat's total shares outstanding to calculate month-end assets under management (AUM). Compustat is our primary source for monthly short interest data.

B.2 ETF Holdings Data

We obtain ETF holdings information from two sources: Thomson-Reuters Global Mutual Fund Ownership and CRSP Mutual Fund Holdings databases. We use $PERMNO$ identifier to merge our ETF sample with these databases. While for many ETFs, both sources contain holdings information, for some there is holdings information only in one of the sources. In many cases, first report dates of portfolio holdings differ between the two. Our approach is to take one source per ETF as reference for its holdings. If an ETF has holdings information in the two sources, we use the one with the start date that is closer to the launch date in CRSP. We notice that CRSP holdings data is relatively more reliable and timely after June 2010, and in the earlier period of the sample, Thomson-Reuters Global ownership is more reliable to track ETF ownership soon after launch dates.

B.3 Firm Level Data

We use Compustat for firm-level accounting information and obtain analysts-forecast-based measure of earnings surprises from I/B/E/S. Firm-level news data are from RavenPack News Analytics. We aggregate daily level news items into monthly-level news counts. 13F institutional ownership data are from Thomson Reuters and Robinhood users data are from Robintrack.

B.4 Financial Markets Data

We calculate risk-adjusted returns using six different risk models: CAPM, and Fama-French 3-factor (Fama and French, 1993), Fama-French-Carhart 4-factor (Carhart, 1997),

[18]DSB: Dedicated Short Bias Funds. More info about Lipper classification codes is provided in: `http://www.crsp.org/products/documentation/lipper-objective-and-classification-codes`.

[19]EDYS: Dedicated Short Bias Funds. EDYN: Long/Short Equity Funds, Equity Market Neutral Funds, Absolute Return Funds, and Equity Leverage Funds. More info about CRSP style codes is provided in: `http://www.crsp.org/products/documentation/crsp-style-code`.

Fama-French 5-factor (Fama and French, 2015), Fama-French-Carhart 6-factor model (Fama and French, 2018),[20] and the Hou-Xue-Zhang q-factor models (Hou, Xue, and Zhang, 2015).[21]

[20] Fama-French factor data are from Kenneth French's website: `https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/`.

[21] Q-factors data library website: `http://global-q.org/index.html`.

Appendix C Variable Definitions

Variable	Definition	Source
ETF-Level Variables		
Number of holdings	The average number of stock holdings in an ETF's portfolio.	Thomson Reuters Global, CRSP Mutual Fund
Fee	Fiscal year-end expense ratio. We use the most recent available information.	Bloomberg
Turnover	The average daily volume over the first six months following the launch date, scaled by daily shares outstanding.	CRSP
Short interest	The average monthly short interest over the first six months after launch, scaled by monthly shares outstanding.	Compustat
Abnormal return	ETF monthly returns minus contemporaneous CRSP value-weighted market returns.	CRSP
Delisted	An indicator for whether the ETF was liquidated as of the end of the sample.	CRSP
AUM	AUM in each year is is the total market value of the investments (\$b).	CRSP
Implied revenue	Implied revenue in each year is computed as fee multiplied by AUM (\$m).	Bloomberg, CRSP
Differentiation	We calculate cosine similarity between an ETF's portfolio weights around launch and the aggregate portfolio weights of existing ETFs in the same category. Product differentiation is computed as $100 \times (1 - \text{Cosine similarity})$.	Thomson Reuters Global, CRSP Mutual Fund
Flow	Flow in month $t+1$ is computed as $100 \times (\text{AUM}_{t+1} - \text{AUM}_t \times \text{ETF return}_{t+1})/\text{AUM}_t$.	CRSP
Age	Age in each month t is an ETF's age in months since the launch month 0.	CRSP
13F ownership	13F ownership is the total ownership of 13F institutional investors.	Thomson Reuters
# Robinhood users	Number of Robinhood users holding an ETF scaled by AUM (\$m).	Robintrack
Firm-Level Variables		
Abnormal return	Stock monthly returns minus contemporaneous CRSP value-weighted market returns.	CRSP
Return skewness	The skewness of monthly returns following Ghysels et al. (2016). We use the 25^{th} and 75^{th} percentiles as cutoffs.	CRSP
Media exposure	Number of monthly news articles scaled by market capitalization.	RavenPack
Media sentiment	Sum of composite sentiment scores of news articles scaled by market capitalization.	RavenPack
Earning surprise	Average earnings-per-share (EPS) surprise scaled by one-quarter-lagged stock price.	Compustat, CRSP
Market-to-book	Monthly market-to-book is computed as market equity divided by book equity.	Compustat, CRSP
Short interest	The ratio of shares shorted to shares outstanding (see Ben-David et al., 2015). We subtract median of the short interest ratio in each month to purge out time components.	Compustat

Figure A.I. ETF Names: Word Cloud

(a) Broad-based ETFs

(b) Thematic ETFs

Appendix D Robustness Analysis on ETF Performance

We restrict the sample of broad-based and thematic ETFs to those that includes at least 80% of their market cap invested in stocks traded in the U.S. and estimate risk-adjusted returns using the calendar-time portfolio approach as in Table 3. The results of the analysis are similar to those reported in Table 3.

Table A.I. Calendar-Time Portfolios Around ETF Launches (U.S. ETFs)

The table presents risk-adjusted performance of ETFs from 2000 to 2019. We require ETFs to hold at least 80% of US stocks in their portfolios. For each month, we identify new ETFs that have been launched within the previous five years, per ETF category. Then we form a portfolio consisting of all new ETF in the same category. The portfolio returns are value-weighted using one-month-lagged market capitalization as weights. Excess return refers to average monthly return in excess of risk-free rate. The portfolios of broad-based (thematic) ETFs include 104 (90) ETFs on average. TH minus BB denotes thematic ETF portfolio minus broad-based ETFs portfolio. The alphas are in percentage points and *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Broad-based ETFs	Thematic ETFs	TH minus BB
Excess return	0.44	0.03	−0.33*
	(1.50)	(0.08)	(−1.74)
CAPM alpha	−0.19*	−0.56***	−0.36*
	(−1.94)	(−3.44)	(−1.95)
FF3 alpha	−0.19*	−0.56***	−0.37**
	(−1.94)	(−3.56)	(−1.98)
FFC4 alpha	−0.14	−0.55***	−0.40**
	(−1.49)	(−3.41)	(−2.12)
FF5 alpha	0.03	−0.41**	−0.48**
	(0.32)	(−2.40)	(−2.37)
FF6 alpha	0.04	−0.41**	−0.49**
	(0.50)	(−2.39)	(−2.39)
Q alpha	0.01	−0.39**	−0.43**
	(0.10)	(−2.36)	(−2.17)