FINANCIAL SERVICES REVIEW

Financial Services Review 28 (2020) 159–177

Active vs. passive, the case of sector equity funds

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Abstract

This paper examines performance of 95 actively managed U.S. sector equity mutual funds from 29 fund families relative to their peer exchange-traded funds, SPDR sector ETFs, in the period of 2008 to 2017. Our results do not show considerable evidence that actively managed sector mutual funds outperform their passive counterparties. None of the mutual fund portfolios produces a significant positive alpha through factor models or delivers a significant positive alpha against their peer ETFs. When focusing on the nine oldest actively managed Fidelity sector mutual funds, outperformance in the period of 1999–2010, which is reported in literature, appears to fade away during the period of 2011-2017. Alpha analyses of a larger sample of 60 sector mutual funds show similar performance deterioration in the same 19-year period. The results indicate that U.S. sector equity market has become more efficient in the past decade.

1. Introduction

Are investors giving up stock selecting? Is the business of picking stocks dying (Tergesen & Zweig, 2016)? Can actively managed mutual funds still be a good choice for investors or financial planners as evidenced by Lin (2014)? The interest to respond to the movement from active to passive fund strategies leads to origination of this paper, which looks into the performance of actively managed U.S. sector equity mutual funds and their peer Exchange-Traded Funds, sector SPDR ETFs, in the past decade.

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1057-0810/20/$ – see front matter

The debate of active versus passive investing has lasted for decades. The indexing concept was introduced to the institutional pension plan market in 1971 and to the mutual fund industry in 1976 (Bogle, 2015). At that time, the indexing strategy was questioned as why investors buy a basket of both good and bad stocks and even was described as "un-American." The core vision, which initiated the indexing strategy and later made it successful, stands on the low-cost goal and a no-load distribution network (Bogle, 2016). Thus, high management and transaction costs, disappointed returns, lack of simplicity and transparency attributed to actively managed funds are commonly stated reasons that make the passive strategy a common wisdom (Brown, 2016; Malkiel & Radisich, 2001; Tergesen & Zweig, 2016). One of the earliest supporters of the index strategy is Burton Malkiel (Malkiel, 1973). At that time, there were no index funds and Burton said that index funds should be available to investors. From the empirical perspective, there are numerous studies that either provide evidence to support active fund managers' stock picking skills (e.g., Lin, 2014; Wermers & Moskowitz, 2000) or suggest that actively managed funds underperform their benchmarks or lack of managers' stock picking persistence (e.g., Fan & Addams, 2012; Malkiel, 1995).

When focusing on U.S. sector investing, sector equity funds started as a mainstay of the mutual fund industry in the 1930s and 1940s but lost heat in the 1950s (Bogle, 2015). In the modern time, sector equity funds returned to the investment world in 1981. They became an equity fund category in addition to U.S. equity funds and international equity funds, and have been widely used by portfolio managers and financial advisors for asset allocation purpose. Today, many retirement saving plans offer a broad range of investment vehicles for individual investors. Sector equity funds appear on the investment menu for millions of plan participants. Because companies in a certain sector/industry are exposed to similar economic/political/technological factors, sector equity funds enable investors to capture certain market opportunities through sector selecting/rotation. Diversification across industries is also easily achievable through investing in sector funds not individual stocks.

The invention of ETFs, the vast majority of which are index funds, has propelled the tremendous growth of indexing strategy. Although both mutual funds and ETFs are pooled investments that represent ownership in a basket of securities, ETFs can be traded in exchange markets just like individual stocks. They are also shortable, marginable, optionable, and provide great transparency, such as investors can obtain an ETF's holding list more frequently than that of a mutual fund. The Federal Reserve started reporting ETF accounts in 1993, the year that SPDR ETFs were launched. The total asset value in mutual funds and ETFs were $1.5 trillion and $464 million at the end of 1993, respectively, and 47% of the mutual funds were equity funds while 100% of the ETFs were equity funds. At the end of 2017, the total asset value in mutual funds and ETFs were $15.9 trillion and $3.4 trillion, respectively. It shows that 68% of the mutual funds and 82% of the ETFs were equity funds. For the most recent ten-year period, 2008-2017, the compound annual growth rates for mutual funds and ETFs are 6.0% and 18.8%, respectively.

According to Morningstar, the total assets for all long-term active funds and passive funds, including both open-end mutual funds and ETFs, were $11.4 trillion and $6.7 trillion at the end of 2017. For the equity component, active U.S. equity net flows have been negative while passive equity net flows have been positive every year since 2006. Sector equity funds have experienced the same trend. At the end of 2017, there were $424 billion of active

sector equity funds and $488 billion of passive sector equity funds, representing 6.3% of active equity funds and 9.1% of passive equity funds, respectively. In 2017, active sector equity funds felt the pain of $18.4 billion of fund net outflow. Passive sector equity funds, on the other hand, attracted $44.2 billion of fund net inflow. This is consistent with total equity fund flows: active equity funds had a net outflow of $190.3 billion while passive equity funds had a net inflow of $468.3 billion in 2017.

How do actively managed sector equity funds perform relative to their passive counterparties in the recent decade? Is indexing strategy in sector equity market a wise decision for investors? Do active fund managers in the sector investing category have a niche compared with the broad market-based equity investing? To answer these questions, this paper looks into performance of United States actively managed sector equity funds for the past 10-year period: 2008-2017.

Our study adds value to the small pool of literature on the topic of sector investing. Cremers, Fulkerson, and Riley (2019) mention that research on active management often excludes sector funds, which means knowledge about them is limited. Dellva, DeMaskey, and Smith (2001) test Fidelity sector equity funds against the broad stock market indexes, which are not investable, for the 1989-1998 time period. Using nine Fidelity Select funds, Lin (2014) shows that actively managed sector equity mutual funds provide better after-expense returns against the broad market ETF- SPY, which tracks the S&P 500, and their peer sector ETFs. However, both studies only focus on one fund family: Fidelity. Other studies such as Chen et al. (2018) and Kaushik et al. (2014) focus fund performance on one sector, healthcare, and provide evidence that actively managed funds perform better than their peer ETFs. Unlike these studies, this paper expands fund scope to multi-fund families and includes not only sector funds but also more narrowly defined industry funds. Kaushik, Pennathur, and Barnhart (2010) report sector aggregate performance results on seven sectors for the period of 1990-2005: Energy, Financials, Healthcare, Precious Metals, Technology, Real Estate, and Utilities. Compared with their work, our nine-sector coverage is more comprehensive. Sectors that are represented in this study are: Materials, Energy, Financials, Industrials, Technology, Consumer Staples, Utilities, Healthcare, and Consumer Discretionary.

2. Sample selection

Our sample includes all active sector equity mutual funds that have price data available for the 10-year period 2008 through 2017 in Morningstar Research Center database. We eliminate funds with assets under management below $100 million. For funds with the same portfolio but multiple classes, class A fund is selected to represent the portfolio. The process has generated a sample of 95 actively managed sector funds from 29 fund families. Table 1 shows the distribution of the sample among mutual fund families and sectors covered.

Fidelity stands out in the fund family list. Its funds account for 50 out of 95 sector equity funds of the sample and represent all nine sectors. Fidelity has a long history of offering sector equity funds. It launched its first sector equity mutual funds on Energy, Healthcare, and Technology in 1981. Besides Fidelity, Franklin Templeton Investments has four funds in four sectors. PGIM, Putnam, and Rydex Funds each has three funds in three sectors.

Table 1 Sector mutual fund sample

Fund family	Number of funds in study	Number of sectors represented in study
1919 Funds	1	1
Allianz Funds	1	1
Berkshire	1	1
Blackrock	2	2
Columbia	2	1
Delaware Funds	1	1
Deutsche	2	2
Dreyfus	1	1
Eaton Vance	1	1
Emerald	1	1
Fidelity	50	9
Firsthand Funds	1	1
Franklin Templeton Investments	4	4
Gabelli	1	1
Goldman Sachs	1	1
Invesco	2	2
Ivy Funds	2	2
John Hancock	1	1
MFS	2	2
PGIM	3	3
Putnam	3	3
Rydex Funds	3	3
Schwab Funds	1	1
USAA	1	1
VanEck	1	1
Vanguard	2	2
Victory	2	2
Wells Fargo Funds	1	1
Williston	1	1
Total Number of Fund Families		29
Total Number of Sector Mutual Funds		95

Blackrock, Deutsche, Invesco, Ivy Funds, MFS, Vanguard, and Victory each has two funds in two sectors. Columbia has two funds in one sector. Each of the other sixteen fund families only has one fund in the sample.

Consistent with Lin (2014), we use Select Sector SPDR ETFs as passive counterparties for sector equity mutual funds since they are the largest sector ETF family and have the longest trading history (Lin, 2014). The SPDR sector ETFs track the Select Sector Indexes. Each stock in the S&P 500 is allocated to one and only one Select Sector Index. The combined companies of the Select Sector Indexes represent all of the companies in the S&P 500. Sector SPDRs were launched in December 1998 with nine ETFs: XLB- the Materials sector; XLE- the Energy sector; XLF- the Financial sector; XLI- the Industrial sector; XLK- the Technology sector; XLP- the Consumer Staples sector; XLU- the Utilities sector; XLV- the Healthcare sector; and XLY -the Consumer Discretionary sector.

Today there are 11 sector SPDR ETFs. The 10th sector ETF, XLRE- the Real Estate Select Sector SPDR, began trading in October 2015. We do not include this ETF because it only covers 26 months out of the 10-year sample period. The 11th ETF, XLC- the

Communications Services Select Sector SPDR, is also excluded because it was launched in June 2018, which is beyond our sample period. Passively managed sector mutual funds are not utilized as benchmarks since they are not common. Only three such funds representing two sectors have price data throughout our sample period, which are not adequate to be included to conduct a comprehensive sector fund research.

3. Fund performance

We compare actively managed sector mutual fund's return to that of its passive alternative and not to the sector index itself since indexes are not investable. For the same reason, we use SPY but not the actual S&P 500 index as an investable broad U.S. equity market benchmark. The monthly returns for both mutual funds and ETFs are calculated as: $R_{i,t} = P_{i,t}/P_{i,t-1} - 1$, where $P_{i,t}$ is the adjusted closing price for fund i at the end of month t, and $P_{i,t-1}$ is the adjusted closing price for fund i at the end of month $t-1$. All returns are net of expenses, commissions, and sales loads.

The distribution of sample funds by sectors in Table 2 shows that Technology has the largest number of funds, 24. It has a representation of 15 fund families, the highest among all sectors. There are 18, 13, and 11 funds in Healthcare, Financials, and Materials, respectively. Consumer Staples only has two funds in the sample. Fidelity is the only fund family that covers Industrials and Consumer Discretionary sectors.

Table 2 also provides a quick comparison of fund annual returns. Panel A shows the top three performing sectors are Technology, Consumer Discretionary, and Healthcare with an average annual return of 15.4%, 15.4%, and 13.7%, respectively. Energy sector, on the other hand, has the lowest average annual return of 2.4%.

However, the sector ETFs' annual returns presented in Panel B tell a somewhat different story. Consumer Discretionary leads with an average annual return of 15.5%. The second best is Technology with an average annual return of 13.8%. Healthcare and Industrials are ranked the third and fourth, followed by Consumer Staples. Consistent with Panel A, Energy ETF generates the lowest average annual return during the sample period, 3.6%, which is higher than that of the mutual funds. Concurrently, the average annual return of SPY is 10.3%.

Compare Panel A to Panel B, mutual funds outperform ETFs in four sectors: Financials, Technology, Healthcare, and Industrials. The annual return differences are 1.8%, 1.6%, 1.5%, and 1.4%, respectively. They largely underperform their ETF counterparty in the Materials sector with an annual spread of -5.0%. However, t test results show that none of the differences between mutual fund and ETF mean returns is significant at the 10% level.

Mutual funds have a tendency of wider return ranges compared with ETFs. All of the maximal returns of the mutual funds are higher than those of ETFs. All of the minimal returns of the mutual funds are lower than those of the ETFs except for Financials. Mutual funds that are actively managed are more likely to have more risk and, thus, have a wider range in returns. Sector mutual funds also have a higher standard deviation in eight out of the nine sectors, which also shows that actively managed funds tend to be riskier than their counterparties. Fig. 1 provides an annual return comparison of equal-weighted sector mutual fund portfolios, their peer ETFs, and SPY by sector/year.

Table 2 Fund annual return statistics, 2008-2017

Panel A: Mutual fund statistics

Sector	No. MF	No. MF family	Annual return			
			Mean	SD	Max.	Min.
Materials	11	8	4.4%	30.0%	78.7%	−61.4%
Energy	9	4	2.4%	29.5%	77.1%	−63.2%
Financials	13	6	9.7%	22.7%	83.6%	−49.9%
Industrials	5	1	12.9%	22.6%	50.7%	−40.2%
Technology	24	15	15.4%	29.2%	90.3%	−57.3%
Consumer staples	2	2	9.6%	12.9%	28.6%	−23.3%
Utilities	9	6	6.7%	16.1%	32.9%	−47.0%
Healthcare	18	10	13.7%	19.8%	68.6%	−44.6%
Consumer discretionary	4	1	15.4%	22.7%	57.8%	−39.3%
Total	95	29				

Panel B: ETF statistics

Sector - ETF	Annual return				*t* test return difference between mutual funds and ETFs (*p*-value)
	Mean	SD	Max.	Min.	
Materials-XLB	9.4%	25.4%	48.2%	−44.1%	0.189
Energy-XLE	3.6%	22.0%	28.0%	−38.8%	0.737
Financials-XLF	7.9%	26.8%	35.5%	−55.3%	0.484
Industrials- XLI	11.5%	22.1%	40.6%	−38.9%	0.153
Technology-XLK	13.8%	24.2%	51.3%	−41.4%	0.541
Consumer Staples-XLP	10.5%	10.6%	26.3%	−15.0%	0.480
Utilities-XLU	7.4%	15.9%	28.7%	−29.1%	0.773
Healthcare-XLV	12.2%	17.6%	41.4%	−23.2%	0.303
Consumer Discretionary-XLY	15.5%	21.8%	42.7%	−33.5%	0.896
SPY	10.3%	19.2%	32.3%	−37.0%	

Note: SPY is the SPDR S&P 500 ETF.

Table 3 reports 10-year holding period returns for equal-weighted sector mutual fund portfolios, the nine sector ETFs, and the SPY. There are four mutual fund sectors outperform their ETF counterparties: Financials, Industrials, Technology, and Healthcare. The return spreads over the 10-year period are 62.2%, 33.9%, 12.6%, and 34.7%, respectively. The four outperforming sectors also have the highest percentage of individual mutual funds that beat their sector ETFs: 92.3%, 80.0%, 54.2%, and 50.0%, respectively. The other five sector mutual fund portfolios, however, lag. The worst performer is the Energy mutual fund portfolio, which generates a loss of 16.5% compared with a gain of 12.8% earned by the Energy ETF. Only one out of the nine Energy mutual funds outperform. None of the two Consumer Staples funds outperforms. The average return of the sector mutual fund portfolios, 124.3%, is lower than the average ETF return, 125.6%; a *p*-value of 0.928 shows the average mutual fund portfolio return is not statistically different from the average ETF return.

When using SPY as the benchmark, both sector mutual fund portfolios and ETFs outperform in the Industrials, Technology, Consumer Staples, Healthcare, and Consumer Discretionary sector. The *p*-values show that neither the average mutual fund portfolio holding period return nor the

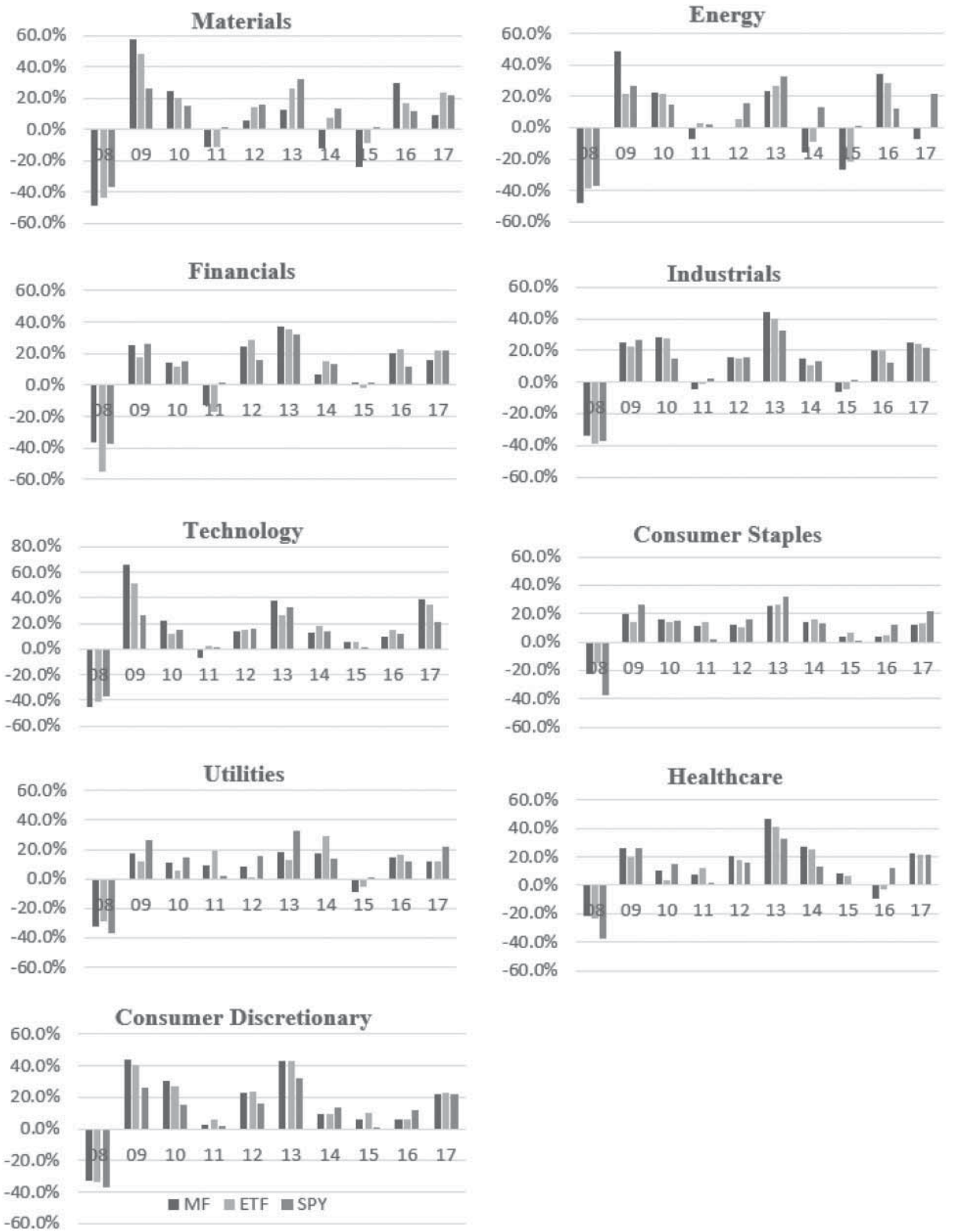

Fig. 1. Annual returns for the mutual fund portfolios, ETFs, and SPY 2008–2017.

Table 3 10-Year holding period return (HPR) comparisons, 2008–2017

Sector	No. MF	MF portfolio HPRs	ETF HPRs	MF beats EFT	No. of MF with a higher HPR than ETF	MF beats SPY	ETF beats SPY
Materials	11	1.0%	82.3%	No	2	No	No
Energy	9	−16.5%	12.8%	No	1	No	No
Financials	13	105.7%	43.5%	Yes	12	No	No
Industrials	5	173.1%	139.2%	Yes	4	Yes	Yes
Technology	24	195.7%	183.1%	Yes	13	Yes	Yes
Consumer staples	2	133.1%	158.8%	No	0	Yes	Yes
Utilities	9	69.2%	81.4%	No	1	No	No
Healthcare	18	214.9%	180.2%	Yes	9	Yes	Yes
Consumer discretionary	4	242.2%	249.1%	No	1	Yes	Yes
Average MF HPR							124.3%
Average ETF HPR							125.6%
SPY HPR							124.4%
p-Value - the average MF HPR different from the average ETF HPR							0.928
p-Value - the average MF HPR different from SPY HPR							0.997
p-Value - the average ETF HPR different from SPY HPR							0.963

Note: SPY is the SPDR S&P 500 ETF.

average ETF holding period return is statistically different from the SPY holding period return, which is 124.4% during the sample period.

Results from Tables 2 and 3 indicate that in some sectors, especially in Industrials, Technology, and Healthcare, sector mutual funds generate superior raw returns during the sample period compared with both the sector ETFs and the SPY. Does the mutual fund's risk adjusted performance differ from that of their peer ETF? Table 4 provides comparisons on both Sharpe Ratios and Information Ratios. During the sample period, Financials, Industrials, and Healthcare mutual fund portfolios generate a higher Sharpe Ratio than their ETF counterparties, with 92.3%, 60.0%, and 50.0% of individual mutual funds outperform, respectively.

Panel B of Table 4 shows that in four sectors both mutual fund portfolio and ETFs report a positive information ratio against SPY: Industrials, Technology, Healthcare, and Consumer Discretionary. Among the four sectors, Industrials and Healthcare have a higher information ratio against SPY than the ETF counterparts, while Technology and Consumer Discretionary present a lower information ratio. It is noticeable that all the ratios are less than 1, with the highest 0.771 from the Consumer Discretionary ETF against SPY. When peer ETF is used as the benchmark, mutual fund portfolios in Financials, Industrials, Technology, and Healthcare sectors generate positive information ratios. However, the ratios are all lower than 0.5. One mutual fund portfolio, Consumer Discretionary, which generates a positive information ratio against SPY, fails to do so when compared with its peer ETF.

In addition to risk-adjusted return measures such as Sharpe Ratio and Information Ratio, we also run regressions based on factor models. One-factor, three-factor, and four-factor models are utilized with commonly used market, small/large size, value/growth, and momentum as regression factors. According to Bogle (2015), one of the situations when passive investing could go wrong is when "subsets of the equity market provide different results from the market as a whole." Simply to say, this is a benchmark selection problem. We address this issue by investigating sector equity mutual fund's performance with two different sets of benchmarks: broad market index ETF, SPY, and sector equity ETFs. That is, either SPY or a sector ETF is used as the market portfolio in the factor models.

Table 5 presents results from three different factor models with SPY as the market portfolio. Alpha estimate, p-value for alpha estimate, and adjusted R^2 are reported for both mutual fund portfolios and ETFs. The number of funds with a positive alpha in each sector is also reported in Table 5.

Results from Panel A, the CAPM model, show that none of the sector mutual fund portfolios generates a significant positive alpha, while two sector ETFs, Consumer Staples and Healthcare, do generate significant positive alphas at the 10% level. Only four out of 95 individual mutual funds generate significant positive alphas: one in Technology, two in Healthcare, and one in Consumer Discretionary. Most ETF regressions have a higher explanation power, adjusted R^2, than that of mutual funds, except for Financials and Utilities.

Similar results are presented in Panel B, the three-factor model, and Panel C, the four-factor model. None of the sector mutual fund portfolios generates a significant positive alpha at the 10% level. Materials sector mutual fund portfolio generates a significant negative alpha. On the other hand, three sector ETFs, Consumer Staples, Healthcare, and Consumer Discretionary, generate significant positive alphas. The same four individual mutual funds as mentioned in the previous paragraph, produce a significant positive alpha. Most ETF regressions have a higher adjusted R^2 than that of mutual funds, except for Financials and Utilities.

Table 4 Sharpe ratios and information ratios, 2008-2017

Panel A: Sharpe ratios

Sector	MF portfolio			ETF			No. MF	No. MF with a higher ratio
	Excess return	SD	Sharpe ratio*	Excess return	SD	Sharpe ratio		
Materials	4.1%	30.3%	0.135	9.1%	25.7%	0.354	11	2
Energy	2.1%	29.9%	0.071	3.3%	22.4%	0.148	9	1
Financials	9.4%	21.7%	0.508	7.6%	27.2%	0.280	13	12
Industrials	12.6%	22.6%	0.557	11.2%	22.5%	0.500	5	3
Technology	15.2%	29.8%	0.508	13.5%	24.5%	0.552	24	3
Consumer staples	9.3%	13.5%	0.694	10.2%	11.0%	0.924	2	0
Utilities	6.4%	16.3%	0.393	7.1%	16.3%	0.434	9	2
Healthcare	13.4%	19.6%	0.684	11.9%	17.9%	0.665	18	9
Consumer discretionary	15.1%	23.0%	0.656	15.2%	22.2%	0.686	4	1

Panel B: Information ratios

Sector	MF portfolio versus SPY			ETF versus SPY			MF Portfolio versus ETF		
	Tracking error	SD	Information ratio	Tracking error	SD	Information ratio	Tracking error	SD	Information ratio
Materials	−5.9%	19.0%	−0.312	−0.9%	10.1%	−0.092	−5.0%	11.1%	−0.450
Energy	−7.9%	19.5%	−0.405	−6.7%	13.1%	−0.511	−1.2%	10.9%	−0.110
Financials	−0.6%	7.2%	−0.084	−2.4%	10.6%	−0.227	1.8%	7.8%	0.231
Industrials	2.6%	7.0%	0.366	1.2%	6.3%	0.195	1.3%	2.7%	0.494
Technology	5.1%	14.2%	0.363	3.5%	9.3%	0.377	1.6%	8.2%	0.201
Consumer staples	−0.7%	7.9%	−0.085	0.2%	10.6%	−0.016	−0.8%	3.6%	−0.233
Utilities	−3.6%	7.5%	−0.478	−3.0%	13.2%	−0.223	−0.6%	6.8%	−0.094
Healthcare	3.4%	11.0%	0.311	1.9%	10.1%	0.185	1.5%	4.5%	0.345
Consume discretionary	5.1%	7.7%	0.661	5.2%	6.7%	0.771	−0.1%	2.3%	−0.043

Note: SPY is the SPDR S&P 500 ETF.

Sharpe ratio = portfolio's excess return/SD of the excess return.

Information ratio = tracking error/SD of the tracking error.

Tracking error is the return difference between the two pairs.

Table 5 Alphas from factor models with SPY as the market portfolio, 2008–2017

Panel A: One-factor model

Sector	MF portfolio				ETF		
	α Estimate	p-Value	Adjusted R^2	No. funds with significant positive α/no. of total funds	α Estimate	p-Value	Adjusted R^2
Materials	−0.69%	0.101	0.57	0/11	−0.35%	0.170	0.81
Energy	−0.79%	0.128	0.47	0/9	−0.49%	0.227	0.54
Financials	−0.13%	0.569	0.79	0/13	−0.18%	0.782	0.42
Industrials	0.13%	0.581	0.78	0/5	−0.06%	0.737	0.88
Technology	0.31%	0.284	0.72	1/24	0.28%	0.136	0.83
Consumer staples	0.27%	0.259	0.57	0/2	0.39%	0.057	0.59
Utilities	0.05%	0.854	0.47	0/9	0.22%	0.500	0.22
Healthcare	0.53%	0.148	0.43	2/18	0.39%	0.085	0.63
Consumer discretionary	0.35%	0.121	0.79	1/4	0.30%	0.112	0.86

Panel B: Three-factor model

Sector	MF portfolio				ETF		
	α Estimate	p-Value	Adjusted R^2	No. funds with significant positive α/no. of total funds	α Estimate	p-Value	Adjusted R^2
Materials	−0.71%	0.099	0.57	0/11	−0.35%	0.168	0.81
Energy	−0.78%	0.135	0.47	0/9	−0.46%	0.249	0.54
Financials	−0.13%	0.565	0.79	0/13	−0.32%	0.618	0.44
Industrials	0.22%	0.337	0.80	0/5	−0.01%	0.942	0.89
Technology	0.32%	0.265	0.72	1/24	0.27%	0.142	0.83
Consumer staples	0.24%	0.319	0.57	0/2	0.34%	0.087	0.60
Utilities	0.06%	0.827	0.46	0/9	0.23%	0.498	0.20
Healthcare	0.56%	0.134	0.43	2/18	0.38%	0.097	0.63
Consumer discretionary	0.36%	0.319	0.79	1/4	0.31%	0.098	0.86

Panel C: Four-factor model

Sector	MF portfolio				ETF		
	α Estimate	p-Value	Adjusted R^2	No. funds with significant positive α/no. of total funds	α Estimate	p-Value	Adjusted R^2
Materials	−0.72%	0.086	0.59	0/11	−0.35%	0.170	0.81
Energy	−0.79%	0.120	0.50	0/9	−0.47%	0.236	0.55
Financials	−0.13%	0.564	0.79	0/13	−0.31%	0.624	0.44
Industrials	0.22%	0.329	0.80	0/5	−0.01%	0.959	0.89
Technology	0.32%	0.269	0.72	1/24	0.27%	0.145	0.83
Consumer staples	0.24%	0.325	0.57	0/2	0.34%	0.088	0.60
Utilities	0.06%	0.835	0.46	0/9	0.23%	0.500	0.20
Healthcare	0.56%	0.136	0.42	2/18	0.38%	0.097	0.62
Consumer discretionary	0.36%	0.107	0.79	1/4	0.31%	0.093	0.86

Note: SPY is the SPDR S&P 500 ETF. Number of observations- 120 monthly returns.

Model used in Panel A: $R_{i,t} - R_{f,t} = \alpha_i + \beta_i(R_{SPY,t} - R_{f,t}) + \varepsilon_{i,t}$.where $R_{i,t}$ is the return of fund/mutual fund portfolio i in month t, $R_{f,t}$ is the return of one-month T-bill in month t, $R_{SPY,t}$ is the SPY return in month t, and $\varepsilon_{i,t}$ is an error term.

Model used in Panel B: $R_{i,t} - R_{f,t} = \alpha_i + \beta_i(R_{SPY,t} - R_{f,t}) + h_i HML_t + s_i SMB_t + \varepsilon_{i,t}$.where HML (High minus Low) is the average return on two value portfolios minus the average return on two growth portfolios and SMB (Small minus Big) is the average return on three small portfolios minus the average return on three big portfolios (Fama & French 1993). The data is downloaded from Kenneth R. French Data Library.

Model used in Panel C: $R_{i,t} - R_{f,t} = \alpha_i + \beta_i(R_{SPY,t} - R_{f,t}) + h_i HML_t + s_i SMB_t + m_i MOM_t + \varepsilon_{i,t}$.where MOM (momentum) is the average return on the two high prior return portfolios minus the average return on the two low prior return portfolios (see Carhart 1997). The data is downloaded from Kenneth R. French Data Library.

The R^2 changes only marginally when adding more factors to the CAPM for both mutual fund and ETF regressions. These results reject the hypothesis that sector mutual fund portfolios outperform market portfolio, SPY, during the sample period.

We tested robustness of our results with two equal subsample periods.[1] None of the sector mutual fund portfolios generates a significant positive alpha for any of the three models in either subsample period. Consumer Staples and Consumer Discretionary ETFs, however, do generate significant positive alphas in the first subsample period, 2008-2012, across three models. None of the ETFs generates a significant positive alpha in the second subsample period, 2013-2017. For the one-factor model, five individual mutual funds in the first half subsample period and two mutual funds in the second half subsample period generate significant positive alphas, respectively.

Using SPY as the market portfolio may be questionable when our goal is to investigate the performance of sector equity funds. The risk exposure of a sector fund should be much narrower than that of the SPY. According to State Street Global Advisors, each of the sectors only represents 2.6% to 26.0% of the SPY companies. Thus, we modify the CAPM by using peer sector ETFs as market portfolios instead.

Results in Table 6 are consistent with results from Table 5. None of the sector mutual fund portfolios generates a significant positive alpha at the 10% level. Only two individual funds outperform their peer ETFs by delivering a significant positive alpha: one in Materials and one in Financials. Most of the adjusted R^2 are higher compared with results in Table 5 Panel A.

Results from factor models do not show significant evidence to advocate the active fund management strategy from the standpoint of sector equity funds. When measured by alpha, not a single sector mutual fund portfolio outperforms either SPY or its peer sector ETF. Only two or three individual sector mutual funds, out of the sample of 95, beat their peer ETFs or the broad market SPY for the period of 2008-2017.

4. Time trend analysis of alpha

Lin (2014) presents evidence that nine actively managed Fidelity sector mutual funds provide higher risk adjusted returns compared with their peer ETFs during the period of 1999-2010. However, results in this study do not show much evidence that actively managed sector funds outperform their passive counterparties. These inconsistent findings demand further research. Are results in Lin (2014) still valid after 2010? We address this question by analyzing sector mutual fund performance in different time periods.

One of the reasons that Lin (2014) focuses on the Fidelity family is that Fidelity was the largest mutual fund family in the United States for several decades until Vanguard moved to the top in 2010. Unlike Vanguard who launched the first index fund, Fidelity has a reputation for actively managed mutual funds. The large size of Fidelity's assets under management enables it to provide economy of scale for security research, which is critical to the key element of active management: security selection. Active managers can beat their benchmark by overweighting future winners, underweighting future losers, or a combination of both besides the freedom of holding cash. Focusing on only one sector, a sector mutual fund manager can potentially grow knowledge and experience in that sector and gradually achieve a

Table 6 Alphas from one-factor model with peer ETFs as the market portfolio, 2008-2017

Sectors	No. of funds	α Estimate	p-Value of α	β Estimate	p-Value of β	Adjusted R^2	No. funds with significant positive α	No. funds with significant negative α
Materials	11	−0.39%	0.226	0.96	0.00	0.91	1	1
Energy	9	−0.24%	0.236	1.16	0.00	0.83	0	1
Financials	13	0.38%	0.273	0.41	0.00	0.50	1	0
Industrials	5	0.20%	0.300	0.90	0.00	0.86	0	0
Technology	24	0.03%	0.889	1.07	0.00	0.71	0	1
Consumer staples	2	−0.05%	0.786	1.01	0.00	0.75	0	0
Utilities	9	0.08%	0.679	0.82	0.00	0.73	0	1
Healthcare	18	0.11%	0.689	1.07	0.00	0.68	0	0
Consumer discretionary	4	0.07%	0.617	0.94	0.00	0.91	0	0

Note: Number of observations-120 monthly returns.

Model used: $R_{MFj,t} - R_{f,t} = \alpha_j + \beta_j(R_{ETFj,t} - R_{f,t}) + \varepsilon_{j,t}$.where $R_{MFj,t}$ is the return of individual mutual fund/mutual fund portfolio of sector j in month t, $R_{f,t}$ is the return of one-month T-bill in month t, and $R_{ETFj,t}$ is the return of ETF in the same sector j in month t, and $\varepsilon_{j,t}$ is an error term.

superior fund performance. Moreover, Fidelity is the only fund family whose actively managed sector funds cover the nine examined sectors in both Lin (2014) and our studies. For instance, in our sample, the second largest sector coverage is Franklin Templeton Investments, whose funds represent only four sectors.

The nine Fidelity sector funds are examined in the same way as Lin (2014) does and the study is continued till the year 2017. Lin chooses the year 1999 as the starting sample period since these nine Fidelity funds had the first full year price data in 1999. The same factor models are used in this paper to match Lin's study but with a longer sample period of 19 years. We also break the nine funds' performance into two subsample periods: 1999 to 2010 and 2011 to 2017. The 1999 to 2010 subsample period is the full sample period of Lin (2014).

Results from the one-factor model with peer ETFs as market portfolios are presented in Table 7. Over the whole sample period, 1999-2017, only one Fidelity sector mutual fund generates a significant positive alpha at the 10% level against peer ETFs: The Fidelity Select Materials Portfolio (FSDPX). When focusing on the two subsample periods, results from Panel B and C show that Fidelity sector mutual funds perform better against their peer ETFs in the 1999-2010 period than in the 2011-2017 period. In the first sub sample period, 1999-2007, four Fidelity funds outperform their peer ETFs: Materials (FSDPX), Industrials (FCYIX), Technology (FSPTX), and Consumer Staples (FDFAX). Fund performance in the first subsample period 1999-2010 is consistent with Lin (2014), which reports the same four Fidelity funds outperform peer ETFs using the one-factor model. Interestingly, none of the funds outperforms in the second subsample period 2011-2017 measured by alpha. Moreover, seven out of nine funds produce a negative alpha given that they are not statistically significant.

Why does performance of the nine Fidelity sector mutual funds deteriorate in the second subsample period? One explanation could be that the U.S. stock market has become more efficient because of increased level of competition over time. Another explanation could be attributed to correlation convergence between sector mutual funds and their ETF counterparties over time. This is the "closet indexing" argument stated by Petajisto (2013). Closet indexing is a strategy used to describe funds that claim to be actively managed investments but wind up with portfolios not much different from their benchmarks. These portfolio managers achieve a return similar to an underlying benchmark without exactly replicating it. To investigate this time-varying dynamic of sector mutual fund performance, we calculate 36-month rolling correlations for the nine Fidelity funds with their peer ETFs.[2]

There is no consistent evidence of correlation convergence over the 19-year period. For most sectors, the 36-month rolling corrections are relatively high in the period of 2008 to 2013. The deep bear market of 2007-2009 could contribute to the high correlation as in falling markets stocks tend to move together. The 2000-2002 bear market also come with a relatively high correlation for several sectors. The deteriorated performance of the nine Fidelity sector mutual funds could not be attributed to the correlation convergence explanation since correlation convergence is not consistently presented.

Results in Table 7 show that the nine Fidelity funds' outperformances from the earlier time period of 1999 to 2010 have disappeared in the later time period of 2010 to 2017. Does performance from the whole group, the active sector mutual funds, exhibit the same down

Table 7 Alphas of nine fidelity funds with peer ETFs as market portfolios

Panel A: Period 1999–2017

Sector	Fund	α Estimate	p-Value α	β Estimate	p-Value β	Adjusted R^2
Materials	FSDPX	0.28%	0.073	0.95	0.00	0.86
Energy	FSENX	0.07%	0.701	1.07	0.00	0.87
Financials	FIDSX	0.05%	0.849	0.60	0.00	0.59
Industrials	FCYIX	0.21%	0.151	0.99	0.00	0.84
Technology	FSPTX	0.37%	0.116	1.17	0.00	0.83
Consumer staples	FDFAX	0.23%	0.135	0.85	0.00	0.63
Utilities	FSUTX	0.05%	0.849	0.72	0.00	0.40
Healthcare	FSPHX	0.32%	0.242	0.78	0.00	0.37
Consumer discretionary	FSCPX	−0.01%	0.955	0.81	0.00	0.70

Panel B: Sub-period 1999–2010

Sector	Fund	α Estimate	p-Value α	β Estimate	p-Value β	Adjusted R^2
Materials	FSDPX	0.45%	0.041	0.94	0.00	0.86
Energy	FSENX	0.18%	0.416	1.07	0.00	0.88
Financials	FIDSX	0.09%	0.647	0.85	0.00	0.85
Industrials	FCYIX	0.38%	0.046	0.98	0.00	0.87
Technology	FSPTX	0.70%	0.021	1.19	0.00	0.87
Consumer dtaples	FDFAX	0.34%	0.094	0.83	0.00	0.62
Utilities	FSUTX	−0.08%	0.834	0.68	0.00	0.34
Healthcare	FSPHX	0.22%	0.500	0.62	0.00	0.31
Consumer discretionary	FSCPX	−0.07%	0.770	0.77	0.00	0.70

Panel C: Sub-period 2011–2017

Sector	Fund	α Estimate	p-Value α	β Estimate	p-Value β	Adjusted R^2
Materials	FSDPX	−0.02%	0.918	0.97	0.00	0.88
Energy	FSENX	−0.12%	0.655	1.06	0.00	0.84
Financials	FIDSX	0.54%	0.225	0.28	0.00	0.25
Industrials	FCYIX	−0.10%	0.672	1.01	0.00	0.77
Technology	FSPTX	−0.09%	0.830	1.09	0.00	0.58
Consumer staples	FDFAX	−0.05%	0.834	0.94	0.00	0.63
Utilities	FSUTX	0.20%	0.415	0.80	0.00	0.64
Healthcare	FSPHX	−0.12%	0.802	1.23	0.00	0.52
Consumer discretionary	FSCPX	−0.17%	0.551	1.00	0.00	0.72

Note: Number of observations: Panel A-228 monthly returns; Panel B-144 monthly returns; Panel C-84 monthly returns.

The Fidelity funds are: Select Consumer Discretionary Portfolio (FSCPX), Select Consumer Staples Portfolio (FDFAX), Select Energy Portfolio (FSENX), Select Financial Services Portfolio (FIDSX), Select Health Care Portfolio (FSPHX), Select Industrial Portfolio (FCYIX), Select Materials Portfolio (FSDPX), Select Technology Portfolio (FSPTX), and Select Utilities Portfolio (FSUTX.).

Model used with ETF: $R_{MFj,t} - R_{f,t} = \alpha_j + \beta_j(R_{ETFj,t} - R_{f,t}) + \varepsilon_{j,t}$.where $R_{MFj,t}$is the return of individual mutual fund/mutual fund portfolio of sector j in month t, $R_{f,t}$is the return of one-month T-bill in month t, and $R_{ETFj,t}$is the return of ETF in the same sector j in month t, and $\varepsilon_{j,t}$ is an error term.

trend as the nine Fidelity funds do? We expand the above time trend study sample to all sector mutual funds from a variety of fund families to see whether the deterioration of alpha is unique to Fidelity funds. Sixty sector mutual funds from the sample of 95 are included in

this analysis. Funds incepted after 1999 and the nine Fidelity funds studied before are excluded.

Table 8 presents results of one factor model of equal-weighted sector mutual fund portfolios against their peer ETFs in the same three time periods as in Table 7, 1999-2017, 1999-2010, and 2011-2017. The Consumer Staples sector is eliminated in Table 8 because the only two funds in the sector are either incepted after 1999 or belong to the nine Fidelity fund group. In Panel A, Industrials, Technology, and Healthcare sector fund portfolios produce a significantly positive alpha for the period of 1999 to 2017. A total number of eleven individual funds from Financials, Industrials, Technology, and Healthcare have a significant positive alpha at the 10% level. When breaking the whole sample period into two subperiods, divergence of results appears. For the earlier subperiod 1999-2010, mutual fund portfolios in four sectors, Materials, Financials, Technology, and Healthcare outperform their peer ETFs with a significant positive alpha at the 10% level. The total count of individual funds with a significant positive alpha is 18. Only two sectors, Utilities and Consumer Discretionary, do not have funds that outperform their peer ETFs. When moving to the second subperiod of 2011-2017, however, only Financials portfolio outperforms with a significant positive alpha. In contrast, the Energy sector portfolio produces a significant negative alpha. Six individual funds from Financials show a significant positive alpha, whereas six funds from Materials and two funds from Energy sector produce a significant negative alpha. Generally speaking, results from Table 8 are similar to Table 7, which confirms the proposition that not only the nine Fidelity funds from Lin (2014), but also a large number of sector funds in this study, have experienced a performance deterioration. Why is the so-called smart money not as smart as investors observed a decade ago? Our explanation is that the U.S. stock market has become more efficient and it is more difficult to hunt alphas even for the smart money. The game has changed as investment assets of low cost index strategies has surpassed assets of active managed funds for the first time in September 2019 (Lim, 2019). The time trend analysis of alphas shown in this study provides explanations of the movement that investors shift their money from active to passive strategies.

5. Conclusions

This paper investigates performance of United States actively managed sector equity mutual funds and their peer SPDR ETFs for the period of 2008–2017. The sample includes 95 actively managed individual sector mutual funds from 29 fund families. A portfolio with multi-funds is constructed for each of the nine sectors: Materials, Energy, Financials, Industrials, Technology, Consumer Staples, Utilities, Healthcare, and Consumer Discretionary. Results show little evidence that actively managed sector equity funds outperform their passive counterparties. Only three or four out of the nine sector equity fund portfolios exhibit a higher Sharpe Ratio or a positive Information Ratio for the sample period. None of the sector equity fund portfolios produces a significant positive alpha using factor models with SPY as the market portfolio, even though several peer sector ETFs do generate significant positive alphas. None of the sector equity fund portfolios delivers a significant positive alpha against their passive managed peer ETFs through the one-factor model.

Table 8 Time trend of alphas with peer ETFs as market portfolios

Panel A: Period 1999-2017

Sectors	No. of funds (60)	α Estimate	p-Value of α	β Estimate	p-Value of β	Adjusted R^2	No. funds with significant positive α	No. funds with significant negative α
Materials	8	0.76%	0.202	0.78	0.00	0.22	0	0
Energy	5	0.10%	0.624	1.15	0.00	0.85	0	0
Financials	11	0.36%	0.102	0.48	0.00	0.54	3	0
Industrials	4	0.32%	0.064	0.81	0.00	0.74	2	0
Technology	14	0.33%	0.071	1.09	0.00	0.88	3	0
Utilities	7	0.16%	0.314	0.72	0.00	0.50	0	0
Healthcare	8	0.48%	0.068	0.77	0.00	0.64	3	0
Consumer discretionary	3	0.16%	0.372	0.86	0.00	0.73	0	0

Panel B: Sub-period 1999-2010

Sectors	No. of funds (60)	α Estimate	p-Value of α	β Estimate	p-Value of β	Adjusted R^2	No. funds with significant positive α	No. funds with significant negative α
Materials	8	0.86%	0.029	0.74	0.00	0.54	6	0
Energy	5	0.44%	0.120	1.14	0.00	0.83	1	0
Financials	11	0.40%	0.036	0.67	0.00	0.81	2	0
Industrials	4	0.34%	0.154	0.79	0.00	0.73	1	0
Technology	14	0.59%	0.009	1.10	0.00	0.91	5	0
Utilities	7	0.17%	0.430	0.72	0.00	0.62	0	0
Healthcare	8	0.55%	0.100	0.61	0.00	0.29	3	0
Consumer discretionary	3	0.17%	0.531	0.83	0.00	0.70	0	0

Panel C: Sub-period 2011-2017

Sectors	No. of funds (60)	α Estimate	p-Value of α	β Estimate	p-Value of β	Adjusted R^2	No. funds with significant positive α	No. funds with significant negative α
Materials	8	0.51%	0.733	0.91	0.00	0.09	0	6
Energy	5	–0.49%	0.026	1.17	0.00	0.91	0	2
Financials	11	0.73%	0.085	0.24	0.00	0.21	6	0
Industrials	4	0.19%	0.416	0.91	0.00	0.75	0	0
Technology	14	–0.08%	0.802	1.07	0.00	0.66	0	0
Utilities	7	0.12%	0.544	0.73	0.00	0.68	0	0
Healthcare	8	–0.24%	0.553	1.22	0.00	0.58	0	0
Consumer discretionary	3	0.00%	0.992	0.97	0.00	0.83	0	0

Note: Number of observations: Panel A-228 monthly returns; Panel B-144 monthly returns; Panel C-84 monthly returns.

Model used: $R_{MFj,t} - R_{f,t} = \alpha_j + \beta_j(R_{ETFj,t} - R_{f,t}) + \varepsilon_{j,t}$.where $R_{MFj,t}$is the return of individual mutual fund/mutual fund portfolio of sector j in month t, $R_{f,t}$is the return of one-month T-bill in month t, and $R_{ETFj,t}$ is the return of ETF in the same sector j in month t, and $\varepsilon_{j,t}$ is an error term.

Moreover, we conduct time trend analysis of fund performance over an extended period, 1999-2017. Our results indicate that outperformance fades away as time passes. This is true for both the nine Fidelity sector mutual funds studied in Lin (2014) and a sample of 60 sector mutual funds with data available in the 19-year period excluding the nine Fidelity funds. Although there are some sector mutual funds outperform in the 1999-2010 period, much less funds outperform in the later period of 2011-2017. This result holds for both equal-weighted sector mutual fund portfolios and individual sector mutual funds. This could be interpreted as the U.S. sector equity market has become more efficient in the past decade than the decade before.

Our results are consistent with many researches, which argue that active managers do not add value after fees and expenses on average, for example, Barras, Scaillet, and Wermers (2010). The value of active management may lie on the concept of making market more efficient by decisions such as asset allocation and security selection as stated by Jones and Wermers (2011). For investors who are interested in sector investing, this study shows that actively managed mutual funds may not be a good candidate for sector allocation or rotation. Instead, passive sector ETFs, which are index-tracking vehicles, can provide average returns with much lower costs and simplicity.

Notes

1 To save space, Tables for the two sub-sample period are not presented. Results are available upon request.
2 To save space, the rolling 36-month correlations are not reported here. Results are available upon request.

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