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A Quarter-Century Retrospective

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In 1993, this journal published one of the first investigations into the impact of taxes on active management performance, "Is Your Alpha Big Enough to Cover Its Taxes?" (Jeffrey and Arnott [1993]). In this article, the authors[1] were the first to introduce the concept of a *tax alpha*, which is almost always negative but surprisingly easy to shrink with diligent management of tax consequences. The article demonstrated that most of the tax impact of active management occurs at very low levels of turnover, making a capitalization-weighted index fund a very difficult benchmark to beat for a taxable investor. This message was widely viewed as a blanket endorsement of cap-weighted indexation. However, the authors also asserted that, with careful planning and execution, active funds (and passive funds) can reduce their tax liabilities by maximizing the accumulation of unrealized capital gains. The authors also introduced tax-management strategies, such as highest-in-first-out accounting, loss harvesting, and lot selection, that can be used to minimize the tax bite in a portfolio. Now, after a quarter century, we ask what has changed in the management of taxable assets and what remains the same.

Most investment management costs, such as management fees, trading costs, and other expenses, are reasonably predictable and can be proactively managed, if not by the investment manager then by the end customer

in choosing the investment manager. As a result, these costs are among the most reliable ways to identify funds with above-average future alpha. At year-end 2016, about one-fourth of U.S. equity assets (or about $6.8 trillion of the $27.4 trillion total market capitalization) were held in taxable accounts, with most of those assets presumably subject to the highest tax bracket.[2] For a tax-sensitive investor, the tax alpha—the largely manageable drag on an investor's return—is often the largest investment-related cost, eclipsing fund expense ratios and trading costs combined.[3] As a result, tax-aware investing and tax-advantaged investing can reduce negative tax alpha and boost realized after-tax returns.

In a survey of investment professionals, Horan and Adler [2009] found that, whereas 90% of respondents considered tax efficiency in choosing mutual fund investments, the process of fund selection remains haphazard and the systematic management of tax alpha remains a niche segment of the asset management industry. In this article we provide a systematic toolkit to help investors identify the funds most likely to produce the highest after-tax alpha. We have organized the article around the following questions[4]:

- How has taxable asset management changed since 1993, and what problems remain largely unaddressed?

- What fund characteristics predict (1) tax-related costs and (2) after-tax fund performance?
- How do smart beta funds, a relatively new (and ill-defined) category of funds, compare to actively managed funds and capitalization-weighted index funds in their ability to generate after-tax alpha?
- What types of vehicles and asset management practices offer higher tax efficiency?

WHAT'S NEW SINCE 1993? AND WHAT'S UNCHANGED?

Since "Is Your Alpha Big Enough to Cover Its Taxes?" was published in 1993, tax-advantaged and tax-aware investing have grown as disciplines in the asset management and fund management arenas, with more attention being paid to the measurement of after-tax investment results and the tax consequences of investment strategies. Exchange-traded funds (ETFs) and smart beta strategies are challenging the basic idea that after-tax alpha is unattainable. We would like to think the 1993 article by Jeffrey and Arnott served as a catalyst for some of these changes.

Tax-advantaged investing, in which the portfolio manager makes the management of tax consequences a central part of the investment process, is now a well-established part of the asset management business. These managers will systematically engage in an array of strategies designed to shrink the negative tax alpha that erodes most investors' after-tax performance. Arnott, Berkin, and Ye [2000]; Berkin and Ye [2003]; Bouchey [2010]; and Arnott, Berkin, and Bouchey [2011], among others, have identified—and in many cases measured the efficacy of—many techniques that allow us to defer taxes with relatively little detriment to a fund's pretax performance. Sadly, however, these techniques command only a small niche in an enormous industry. Some of these strategies are:

- Deferral of capital gains: deferring sales as long as possible to avoid realizing capital gains and triggering the related tax liability. Bob Kirby, the legendary leader of Capital Group in the early decades of its growth, liked to say that portfolio managers "take profits faster than Wyatt Earp in a gunfight."[5] In so doing, the portfolio manager incurs a reliably negative tax alpha in the quest of a hoped-for (and all-too-often negative) pretax

alpha. Viewed from this perspective, the folly of realizing gains too quickly becomes self-evident.
- Loss harvesting: selling assets whose market value is lower than their cost basis to realize a capital loss, which can offset realized gains on other assets at the present time or in the future. The portfolio manager can repurchase the asset after 31 days to avoid the wash-sale rules. The consequences of missing 31 days of investment performance is likely a symmetric risk—as liable to hurt as to help pretax portfolio performance—unless the portfolio manager has remarkable short-term investment skill.
- Lot selection: selecting the particular holding (or lot) of an asset with the cost basis that produces the best tax outcome when a position in an asset is being reduced. For example, we can select lots that qualify for long-term capital gains treatment (versus lots held less than 12 months and subject to short-term gains treatment) or choose lots with the highest cost basis to minimize the taxable gain.[6]
- Wash-sale management: coordinating among portfolio managers under a single administrator to transfer assets to avoid running afoul of the wash-sale rules[7] or of other undesirable tax consequences.
- Dividend avoidance: waiting to purchase a stock that is about to go ex dividend (i.e., qualify an investor for the next dividend payment) to avoid the dividend income and associated taxes. This strategy is less relevant in the case of a stock sale because the tax rate on the dividend income is typically the same as the tax rate on the capital gain.[8]
- Holding-period management: choosing when to sell an asset to get the most favorable capital gains tax treatment. Suppose a portfolio manager wants to liquidate a profitable investment that will qualify for long-term capital gains treatment in two weeks. Unless the manager has an extremely strong fundamental case for selling immediately or has great faith in his or her short-term timing skill, holding the asset for another two weeks is almost always the better choice.
- Yield management: selecting low-yield stocks because they incur lower taxes than high-yield stocks. This strategy, however, is a two-edged sword because high-yield stocks have historically offered a slightly higher pretax return (especially on a risk-adjusted basis) than low-yield stocks. Consequently, it is not a strategy that offers

unalloyed tax benefits with no hidden costs, but it does still merit consideration. A related point is that zero-yield stocks have historically offered higher pretax returns than high- or low-yield stocks, and the avoidance of unnecessary taxation merely offers an additional reason to consider owning them.
- And the list goes on.

Tax-aware investing, as distinct from tax-advantaged investing, is a much larger segment of the investment management arena. Many funds and investment managers are far more tax aware than they were in 1993. Tax-aware fund managers may engage in year-end tax-loss harvesting, defer sales of assets that are about to become long-term investments, and so forth. Unlike in tax-advantaged investing, in tax-aware investing, managers do not have a systematic process that seeks to objectively and aggressively manage the tax consequences of their investment decisions for their clients. Thus, these managers may capture some of the benefit of tax-advantaged investing but place the quest for an uncertain (and all-too-often negative) pretax alpha ahead of the quest for a predictable and manageable reduction in the drag associated with reliably negative tax alpha.

Over the last 25 years, three other notable changes have occurred in the investment landscape that have had a beneficial impact on an investor's after-tax rate of return. First, investors and the consulting world are now tax aware. Few financial advisors will disregard tax consequences in choosing an investment manager. Since 2001, just eight years after the publication of Jeffrey and Arnott [1993], the Securities and Exchange Commission (SEC) began requiring mutual funds to disclose in their prospectuses their after-tax returns based on standardized formulas.[9] Morningstar, along with other fund-rating services, now systematically publishes and evaluates after-tax returns for mutual funds and investment managers.

Second, the introduction of ETFs and exchange-traded notes (ETNs) (and to a lesser extent long-dated swaps) now offers the long-term investor a powerful tool for tax efficiency: Capital gains taxes are deferred until the fund is sold, at which point lower long-term capital gains treatment applies. To many investors, however, an ETF is merely a type of mutual fund that allows for intraday trading; these investors are far more interested in that feature than in the tax benefits, which only accrue to long-term buy-and-hold investors, who represent a very small part of the ETF marketplace.

Third, the advent of so-called smart beta strategies appears to offer an important new path to after-tax alpha. Sadly, the term *smart beta* has become so vague as to be meaningless. Under that rubric, however, some strategies do offer very low turnover, large capacity, and a rebalancing alpha that seems robust, net of Fama–French factors. These strategies, as with many active strategies, can become even more compelling for the taxable investor when offered in an ETF.

In a world in which prospective stock and bond market returns are unlikely to rival the results of the past quarter century, the tax consequences of investing matter a great deal. The increasing number of tax aware investment strategies and structures is a very welcome change.

Other things, however, have not changed. Perhaps the most important is that persistent manager alpha remains rare and difficult to predict. Worse, many common manager-selection practices—notably, performance chasing—erode, rather than help, performance (Arnott, Kalesnik, and Wu [2017]). Furthermore, most mutual funds, relative to cap-weighted index funds, continue to exhibit after-tax performance far worse than their pretax alpha. This is not the same as saying the quest for alpha is a waste of time. These facts merely prove that most investors fail in their pursuit of alpha on both a pretax and after-tax basis.

WHERE TO LOOK FOR AFTER-TAX ALPHA?

The academic literature on manager skill is plentiful, highly nuanced, and perhaps agrees only on the point that, if skill exists, it is not very persistent and it is hard to identify. The literature on after-tax manager skill is sparse.[10] The early work of Sharpe [1966] and Jensen [1968] found no evidence for persistence in the average manager's performance. Nearly 25 years later, Hendricks, Patel, and Zeckhauser [1993] found some evidence of manager performance persistence after controlling for the three Fama–French factor exposures. Soon thereafter, Carhart [1997] showed that this small amount of performance persistence disappears when, in addition to the Fama–French three factors, the study controls for momentum. More recently, Kosowski et al. [2006] and Kosowski, Naik, and Teo [2007] found evidence of some persistence in skill when they controlled for multiple factors and adjusted for other aspects of manager performance, such as non-normality of return.

Harvey and Liu [2018] demonstrated the lack of repeatability in performance resulting from noise in the returns, which makes performance-chasing manager selection largely futile. To make things worse, Kinnel [2005, 2014, 2015, 2016] and Hsu, Myers, and Whitby [2016] demonstrated that an investor's dollar-weighted return is lower than his or her time-weighted return, to an extent that is both statistically and economically significant. It would seem that investors allocating capital to funds with a recent history of superior performance reach maximum exposure and assets under management (AUM) just before performance turns south and, similarly, trim allocations to underperforming funds, reaching minimum exposure just as performance rebounds. Arnott, Kalesnik, and Wu [2017] showed that this trend-chasing rule favors funds with recently expensive style exposure in lieu of funds with recently cheap style exposure. This makes traditional manager-selection practices actually value destructive: Most investors would be better off hiring their losing managers and firing their winning managers.

According to our estimates using Morningstar Direct data, an average actively managed fund that survived the period 1993–2017[11] lost 1.1% of its pretax return (and alpha) to management fees and another 2.4% to taxes.[12] The two primary types of tax that concern us in our analysis of U.S. equity funds are capital gains tax on realized gains and income tax on dividends.

When an investor sells a security, the realized capital gain on that security is subject to either long-term or short-term capital gains taxation. Short-term capital gains (if the holding period is one year or less) are taxed at the federal level at the same rate as ordinary income. As of 2018, as provided by the Tax Cuts and Jobs Act of 2017, the rate for the highest ordinary income tax bracket is 37%. When we add uncapped Federal Insurance Contributions Act payroll tax, the total rises to 39.35%. Long-term capital gains are taxed at a federal rate of 23.8% in the highest income bracket.[13] Dividends are taxed at the same rates as capital gains: 37% for dividends earned on stocks held less than a year and 20% for dividends earned on stocks held longer, both with a 3.8% Obamacare surtax, for a combined rate of 40.8% and 23.8%, respectively.

Whenever investors sell their securities at a profit, they forgo the opportunity to defer taxes—and continue to earn a return—on the unrealized gains on those securities. This erodes an investor's after-tax return. Unrealized gains are the part of the portfolio's value that

has not been cashed in and thus has not yet been diminished by taxes. These unrealized gains are an immensely valuable asset because they allow taxable investors to continue earning a return on the deferred tax liability not due until the gains are eventually realized. Bogle [1997] compared unrealized capital gains to a free loan from the IRS—their time value can grow significantly with the investment horizon.

All else equal, the larger the deferral, the bigger the after-tax benefit is for a taxable investor. Generally, we can maximize this deferral by limiting turnover and extending our gains for as long as possible. Most investors forfeit most or all of this opportunity by not allowing their gains to build, as is evidenced by the ever-rising turnover in mutual funds and ETFs. This is not likely to change any time soon. Financial advisors and registered investment advisors risk losing their clients if they counsel patience and do not regularly suggest changes in their clients' portfolios.

Turnover is a powerful predictor of the tax efficiency of a strategy because most turnover creates a taxable gain when a security is sold. (We empirically test this statement later in the article.) Deliberate loss harvesting is a tax-reducing strategy, but very few mutual fund managers harvest losses in any rigorous or systematic way. As mutual fund turnover has ratcheted higher and higher over the years, more capital gains are short term, triggering maximum tax consequences. Investors pay taxes on those realized gains and forgo the opportunity to earn a profit on deferred taxes from unrealized gains. The horn-like chart in Exhibit 1, adapted from Jeffrey and Arnott [1993], shows the positive relationship between the size of a portfolio's unrealized gains (the gap between cost basis and market value) and its pretax terminal market value (the upper curve). The upper curve also shows how steeply the terminal value drops, even at very low levels of turnover. The tax rates of today are somewhat higher than 1993 rates, so these effects are somewhat stronger now than they were in 1993.

Exhibit 2 is also adapted from Jeffrey and Arnott [1993] and is based on a very simple assumption of 6% portfolio price appreciation at various levels of turnover. The exhibit shows that terminal wealth drops by nearly 20%, from $321 to $263, as annual turnover moves from 0% to a low 10% (in 1993, the capital gains tax rates used by Jeffrey and Arnott were very similar to current short-term capital gains tax rates).[14] This was one of the most shocking findings of Jeffrey and Arnott: The first 10% in

Turnover Effect on Taxes

Effect of Turnover on 20-Year After-Tax Growth of $100
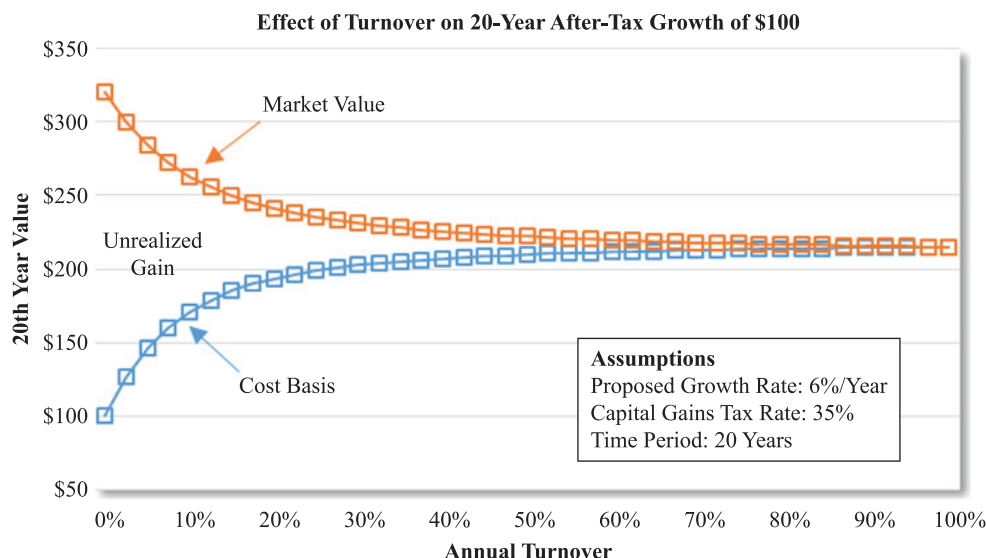
Source: Research Affiliates, LLC.

E X H I B I T 2

Examples of Turnover Effect on 20-Year After-Tax Growth∗

	Annual Turnover					
	10%				**0%**	**100%**
Year	**1st**	**2nd**	**20th**	**∑1…20**	**20th**	**20th**
Beginning market value	100.00	105.79	251.19			
Ending market value before taxes	106.00	112.14	266.27			
Beginning cost basis	100.00	100.39	164.17			
Realized gain	0.60	1.17	10.21	108.93	0.00	176.83
Capital gains tax	0.21	0.41	3.57	38.13	0.00	61.89
After-tax proceeds reinvested	0.39	0.76	6.64	70.81	0.00	114.94
Ending cost basis**	100.39	101.15	170.81		100.00	214.94
Ending market value	105.79	111.73	262.69		320.71	214.94

*Assumes principal growth of 6% per annum and a capital gains tax rate of 35%. **Note that the difference between the ending and beginning cost bases is the after-tax proceeds of the realized gains.*

Source: Research Affiliates, LLC.

annual turnover does as much damage to ending wealth after 20 years as an increase in annual turnover from 10% to 100%.[15] A turnover rate beyond 100% does not further worsen the tax impact on ending market value because no unrealized gain remains in the portfolio to be realized and taxed. The cost basis on all securities is refreshed annually, and all gains are short term.

The remainder of this article addresses three questions: (1) What fund characteristics reduce the performance drag from taxes, both before and after final portfolio liquidation? (2) How do active, passive, factor, and smart beta options differ in the after-tax alpha they produce? And (3) How do different types of investment vehicles compare in tax efficiency?

DATA

Our research focuses on the tax efficiency of U.S. equity funds. We limit our survey to U.S.-benchmarked mutual funds and ETFs with at least two years of live history in the Morningstar Direct database. For mutual funds, we use the share class (institutional, A, or no-load) that has the longest history. For strategies that employ both a mutual fund and an ETF, we use which-ever has the longest history. We have a large sample of funds (more than 4,000) with an average of 10 years of return history per fund.

We subdivide our fund universe into four categories: active, passive, factor, and smart beta funds. We use Morningstar's categorization to identify passive funds. We use a keyword method[16] to classify funds as factor funds or as smart beta funds. The smart beta funds tend to include the first generation of smart beta funds, many of which sever the link between the price of a stock and its weight in the portfolio. The factor category combines both passive and active funds that have a specific factor keyword in the fund name. We create baskets of funds by combining funds sharing a specific keyword in their names and compute the performance of these baskets.

Our retrospective analysis begins with the publication date of the article by Jeffrey and Arnott [1993]. We examine 25 years of fund performance (from January 1993 through December 2017) and the most recent 10 years (from January 2008 to December 2017) to see if recent patterns match the past quarter century. We perform a separate test on all funds (including both surviving and nonsurviving) and on the funds that survived the entire 25-year and 10-year periods. Our tests calculate four return types, which are described in the following section. For our tests on the full sample, we focus on after-tax returns before liquidation because the funds will have different start and end dates. For our tests on the surviving funds, we can include liquidation taxes, but we then have survivorship bias. We think the most interesting results are the 25-year test on the full sample, net of only the taxes before liquidation, and the 10-year test on the surviving funds, net of all taxes, including liquidation tax.[17]

FUND RETURN TYPES

To calculate after-tax returns, we use the method in Exhibit 2, which is explained here and in more detail in the Appendix. Similar to the SEC's guidelines for calculation, we assume the highest federal tax rate for each year, for each type of distribution, at the time of the distribution; for example, the maximum 1999 capital gains and income tax rates are used for the 1999 distributions. We ignore state and local taxes in our analysis and do not take into account the effect of the alternative minimum tax. Investors, however, should take these taxes into consideration because this additional tax burden only strengthens our conclusions.

We calculate four types of return to analyze the tax efficiency of different strategies and vehicles: gross of fees, net of fees, after-tax preliquidation, and after-tax postliquidation. All returns are annualized geometric total returns for the holding period. The returns are related as follows:

- We begin with the gross-of-fees return.
- If we subtract the fund's expense ratio, we get the net-of-fees return, which is the annualized return commonly reported in the fund literature and news reports.
- If we then subtract the tax incurred as a consequence of dividends paid and capital gains distributions made over the holding period, we get the after-tax preliquidation return.
- Finally, when we subtract the long-term capital gains tax due at the end of the holding period, after realizing all remaining unrealized gains, we arrive at the after-tax postliquidation return.

Because fees and taxes almost always reduce performance, these returns generally fall monotonically: gross-of-fees return > net-of-fees return > after-tax preliquidation return > after-tax postliquidation return. Rare exceptions to this rule can occur—for example, when the fund has realized losses so that the after-tax return(s) is (are) higher than the net-of-fees return (and sometimes even the gross-of-fees return), or when the fund has unrealized losses at the end of the holding period so that the after-tax postliquidation return is higher than the after-tax preliquidation return.

We recognize that a fund's performance may be influenced by its style over our analysis period. In Exhibit 3, we show the annualized returns of indexes (compound geometric returns) that represent the major styles over the latest 10- and 25-year periods ending December 2017. Over the longer time sample,

E X H I B I T   3
Style Performance, January 1993 to December 2017

Index	Style	Past 25 Years	Past 10 Years
S&P 500	Large Blend	9.7%	8.5%
Russell 1000 Value	Large Value	10.1%	7.1%
Russell 1000 Growth	Large Growth	9.1%	10.0%
Russell Mid Cap	Mid Blend	11.2%	9.1%
Russell Mid Cap Value	Mid Value	11.6%	9.1%
Russell Mid Cap Growth	Mid Growth	9.8%	9.1%
Russell 2000	Small Blend	9.5%	8.7%
Russell 2000 Value	Small Value	10.7%	8.2%
Russell 2000 Growth	Small Growth	7.9%	9.2%

Source: Research Affiliates, LLC, using data from Morningstar Direct.

value-oriented indexes outperformed the broader market indexes and the growth indexes—evidence of the value premium, amply documented in the literature. Over the last 10-year period, the picture reversed as value lagged growth by a near-record margin. As our own research has shown, this does not suggest that the value premium is dead. Long periods of underperformance are commonplace in factor returns. In this particular case, our own research strongly suggests that recent weak performance is a direct consequence of value becoming cheaper relative to growth, quite possibly setting the stage for a robust period of outperformance. This finding is important in the context of our research on tax consequences for investors in two ways: First, the quest for alpha is not a waste of time; and second, value investing is a shared attribute of most smart beta strategies.

FINDING TAX-EFFICIENT ACTIVE MANAGERS

Because taxes are paid on dividend income and on capital gains—the two primary components of an investment's return—higher performance should go hand in hand with higher taxes. Consequently, the strongest predictor of the tax burden a fund imposes on its investors is fund performance. Turnover—to the extent that it causes gains to be realized—and dividends are intrinsically linked to a fund's tax burden. To reduce the tax burden without reducing fund performance, the best tax strategy is to allow gains to remain unrealized and to grow untaxed. We empirically test this thesis

by examining the tax burden of the surviving active mutual funds in our sample. The dependent variable is the reduction in fund performance as a consequence of taxes, which is the tax alpha. We can refer to that tax alpha as the *tax burden*, a more appropriate name given the negative alpha associated with taxes.

We calculate the tax burden in two ways: before and after liquidation. The tax burden before liquidation is paid on dividend distributions and capital gains realized in the fund during the year. We measure the tax burden before liquidation for all funds in the database for each year the fund was alive. The tax burden after liquidation includes the tax on capital gains realized as a result of the sale. The after-liquidation tax burden is start- and end-date dependent so that comparing the tax burden after liquidation between funds with different start and end dates is like comparing apples and oranges. For an accurate comparison, we must use the same start and end dates for all funds in the regression. This constraint introduces survivorship bias because we have to exclude all funds that started trading after the start date or stopped trading before the end date. The worst-performing funds will typically not survive and, therefore, will not be in our sample.

Exhibit 4 displays the results of our fund/year tax burden analysis of all funds in our 10- and 25-year samples, based on the year-by-year tax burden before liquidation and on the measurable fund characteristics. A third test, with results also reported in Exhibit 4, is a 10-year regression of the surviving funds over the 2008–2017 decade, based on a buy-and-hold scenario with a tax burden calculated after liquidation. We have a large sample of active mutual funds (over 3,500 funds, with an average of 11 years of data per fund) to estimate the key drivers of tax alpha before liquidation and a smaller sample size—with survivorship bias—to estimate the key drivers of the tax burden after liquidation (1,418 funds over the 10-year span).

For each test, we measure the results for two alternate measures of the tax burden: the tax burden as a decrement to the return and the tax burden as a fraction of the net-of-fees return. For instance, if a fund has a 10% net-of-fees return and taxes reduce that return to 8%, then the decrement to return is 2% and the fraction of return is 20% (i.e., 20% of the total return was paid in taxes to the IRS). For our analysis of taxes before liquidation, the results for the 10- and 25-year samples are in the left four column-pairs of Exhibit 4. The rightmost

EXHIBIT 4

Explaining the Tax Burden of Active Mutual Funds: Year-over-Year for 25 Years, Year-over-Year for 10 Years, and 10-Year Hold then Liquidate, All Ending December 2017

Independent Variables:	Dependent Variables:											
		Preliquidation						Postliquidation			
		Fund/Year Tax Burden, 25-Year Period as				Fund/Year Tax Burden, 10-Year Period as				10-Yr Annualized Tax Burden, Surviving Funds as			
		Decrement to Return		Fraction of Return		Decrement to Return		Fraction of Return		Decrement to Return		Fraction of Return	
Intercept		1.06	**(9.57)**	13.81	**(8.71)**	1.26	**(10.86)**	9.45	**(5.16)**	−0.89	**(−6.57)**	7.42	**(5.32)**
Gross Return, Matching Period		1.57	**(12.85)**	−42.25	**(−24.27)**	1.06	**(6.63)**	−35.04	**(−13.94)**	16.73	**(26.84)**	−16.99	**(−2.64)**
Undistributed Capital Gains, Previous Year		2.03	**(18.34)**	23.86	**(15.14)**	0.28	(1.95)	14.82	**(6.47)**				
Turnover Ratio, Matching Period		0.30	**(17.79)**	1.16	**(4.79)**	0.21	**(11.40)**	1.07	**(3.63)**	0.21	**(10.51)**	2.00	**(9.78)**
Dividend Yield, Matching Period		10.45	**(6.47)**	124.70	**(5.41)**	12.68	**(7.61)**	132.78	**(5.06)**	12.37	**(4.65)**	155.63	**(5.66)**
Fund Size (Log (AUM))		0.02	(1.27)	0.47	**(2.77)**	0.02	(1.33)	0.52	**(2.67)**	0.11	**(8.68)**	1.35	**(10.18)**
Flows/AUM, Matching Period		−0.47	**(−21.86)**	−4.38	**(−14.41)**	−0.66	**(−23.55)**	−5.81	**(−13.22)**	0.001	(0.75)	0.014	(0.66)
Value-Growth Style, Morningstar Measure		0.02	(1.76)	−0.28	(−1.59)	0.07	**(5.41)**	1.41	**(6.80)**	−0.01	(−0.47)	−0.15	(−0.72)
Size Style, Morningstar Measure		−0.09	**(−8.88)**	−1.43	**(−9.38)**	−0.08	**(−7.14)**	−1.33	**(−7.58)**	0.02	(1.59)	0.25	(1.85)
Year Fixed Effects		Yes		Yes		Yes		Yes		No		No	
R2		0.78		0.48		0.30		0.39		0.46		0.25	

Note: All coefficients are displayed as percentages. Bold T-Stats signify statistical significance at a 5% level (P value < 0.05).

Source: Research Affiliates, LLC, using data from Morningstar Direct.

two column-pairs show the results for our analysis of taxes after liquidation.

For these tests, the independent variables are gross return for the matching year(s), unrealized capital gains from the prior year, turnover, dividend yield, fund size (AUM), and flows as a percentage of fund size; for all variables except unrealized capital gains in the prior year, we use same-year data. We also include Morningstar measures for value-growth and size styles. This roster covers the most popular variables used in forecasting fund returns discussed in the literature plus current-year return, which can directly influence the current year's tax drag. We use the same variables for the analysis of tax burden after liquidation, with the exception of undistributed capital gains.

As expected, the realized fund return is the big driver of the tax burden, which is measured as the decrement to the return and mechanically explains most of the differences in tax expense. Unfortunately (barring the invention of a crystal ball or some other means of clairvoyance), this observation does not help us much, and we would hardly prefer funds with terrible performance just because the tax burden is minimal.

For a better understanding of what the data in Exhibit 4 are actually telling us, let's look more closely at a few of the numbers. What does the 1.57 coefficient

for Gross Return mean? Over the last 25 years, any single year's return created an immediate tax consequence 1.57% as large as the gross return. This sounds like a 1.57% tax rate, but remember that any gains not realized in any given year roll into the new Undistributed Capital Gain. Deferring gains—and not yet having to pay taxes on them—is generally a good thing. Any undistributed capital gains from the previous year-end trigger an additional tax liability of 2.03% of the undistributed gain in the subsequent year, based on whichever of these gain is realized. Again, some of this may well be carried forward into another calendar year.

The tax burden as a fraction of return automatically adjusts for the mechanical relationship between the tax burden and return. The linkage with Gross Return changes sign. Higher returns lead to lower taxes as a percentage of the return. This should come as no surprise because some of that return may be retained, showing up in some future year's taxable cap-gains distribution.

Quite consistently across the left four column-pairs, we observe that the unrealized capital gains from the previous year as well as the matching-period turn-over, dividend yield, fund outflows, and small-cap style orientation are all associated with a higher tax burden. The growth style exposure is associated with a higher tax burden only in the last 10 years, even net of the per-

formance advantage of these funds, but not over the full 25-year horizon. Our fund/year framework is similar to that of Bergstresser and Poterba [2002], and most of our results are consistent with their findings. New to the literature is our empirical documentation of the strong relationship between the dividend yield and the tax burden.

Thus far, we have discussed year-over-year results, but a buy-and-hold strategy is more sensible for a long-horizon tax-sensitive investor. Because a fund's characteristics can change over time, the investment outcomes of a long-term buy-and-hold investor can also materially change, unless the investor rotates among funds to maintain the desired characteristics. This rotation, however, may require selling existing holdings and realizing capital gains, which can defeat the purpose of tax-sensitive investing.

The results of the buy-and-hold 10-year sample, displayed in the right two column-pairs of Exhibit 4, validate that higher turnover, dividend yield, and fund size are associated with a higher tax burden. Interestingly,

in this case, the outflows experienced over a long period do not lead to a significantly higher tax burden, nor do the size and value-growth style orientations. The last of these may be tied to a decade in which growth beat value by over 3% per annum, a remarkable decade on this dimension.

We also display a set of results in the Appendix for which we use several of the variables in the predictive setting. In these results, all variables except for the matching-period gross return are measured ex ante. Previously, we observed that matching-period turnover and dividend yield are associated with a higher tax burden. Now we observe that the same variables are also predictive of the tax burden over a 10-year period. This predictability likely arises due to persistence in the dividend yield and turnover of funds.

Exhibit 5 displays the distribution of the gross annualized fund returns and tax burdens for the funds analyzed over the 10- and 25-year periods. Unlike the relationship observed for the funds in the 10-year sample, shown in Panel A, the multivariate regression analysis

Exhibit 5
Tax Burden vs. Gross Annualized Fund Return, All Surviving Funds
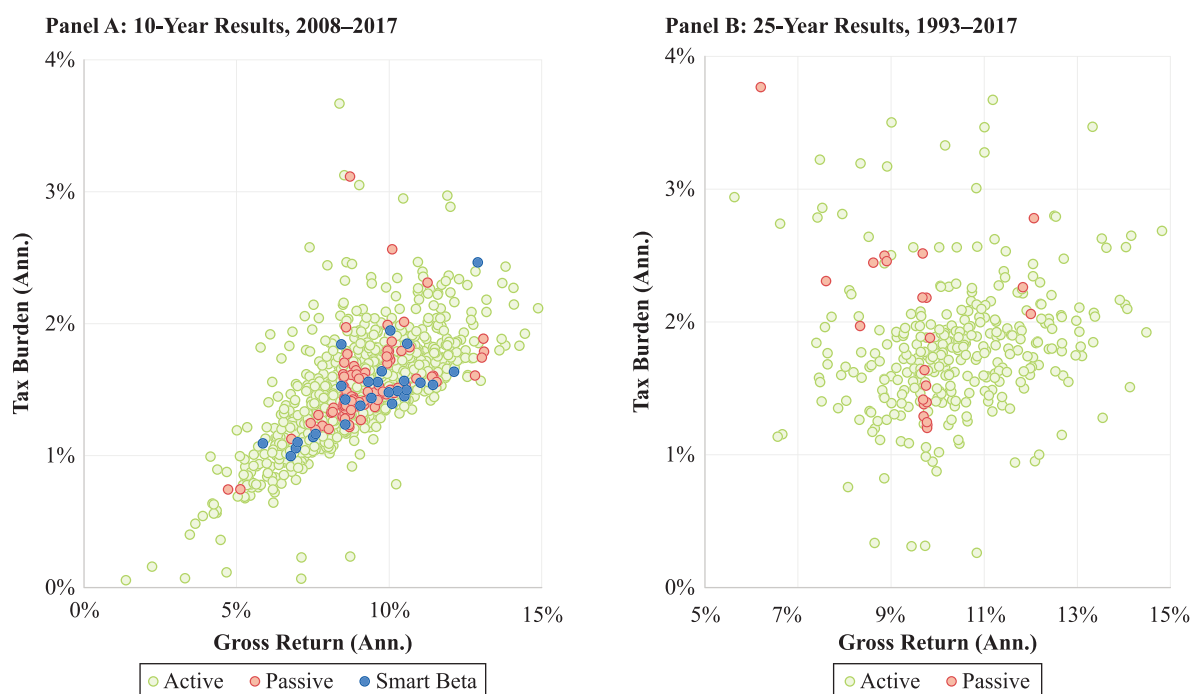
Note: The analysis includes 373 funds in the 25-year sample and 1,418 funds in the 10-year sample.
Source: Research Affiliates, LLC, using data from Morningstar Direct.

of the funds in the 25-year sample, shown in Panel B, finds no predictability of the tax burden based on fund return. We hypothesize that the survivorship bias may be responsible for the lack of relationship. The survivorship bias would manifest itself in several ways: the narrower dispersion of the gross average fund returns, potentially more homogeneous management skill, and likely steady cash inflows, as well as a number of other systematic characteristics that make the surviving sample qualitatively different from the original sample available to investors.

Smart beta and passive funds are included along with active funds in Exhibit 5. The distributions of the returns and the tax burdens for smart beta and passive funds tend to cluster together; the return distribution is relatively narrow, and the tax burden tends to be relatively low. (We will cover the differences among the three fund categories in more detail later.) In the 25-year sample, a cluster of passive funds has gross returns a notch lower than 10%; these are all tracking the market. Despite having an almost identical average return, the tax burden these funds generated ranges from 1.2% to 2.5%—quite a big difference! To put this in perspective, the 1.3% annualized return difference between the most and least tax-efficient passive market funds means that the most tax-efficient generated over 30% more wealth by the end of the 25-year period than the least tax-efficient, even if the gross returns are the same. Although passive funds generally tend to be more tax efficient, avoiding the tax-inefficient funds is still very important.

Of the fund characteristics we measure, the strongest predictors of future tax expense are fund turnover and starting dividend yield because they both trigger an immediate tax liability that inhibits the benefits of compound growth by reducing the size of the unrealized gain on which we can continue to earn profits. Our finding is consistent with those of Longmeier and Wotherspoon [2006] and Bergstresser and Poterba [2002].[18] Tax-sensitive investors are well advised to stay away from active funds that boast frequent trading and claim an ability to capture short-term growth opportunities. Only the best of these can capture any alpha, net of the incremental taxes that they trigger. In the recent low-yield environment, many income funds were marketed to retail investors as a way to increase current yield. Historical evidence and common sense suggest that tax-sensitive investors

may be better served by avoiding funds touting higher income.

The other variables in Exhibit 4 that show some power in predicting tax burden are fund size and net outflows, both of which tend to increase tax obligations. Our first finding is consistent with that of Sialm and Starks [2012], who found that "mutual funds held primarily by retirement accountholders tend to be less tax efficient than other types of funds" and that funds with a high ratio of defined contribution (DC) to non-DC funds tend to have "greater assets under management, and are part of larger families of funds as compared to low DC funds." The linkage with outflows is unsurprising because mutual fund managers are forced to sell underlying securities, realize capital gains, and pass that tax expense on to their fund investors. This is an unfortunate tax inefficiency of the mutual fund structure.

Our mutual fund data include only quantifiable fund characteristics, not qualitative attributes. A number of techniques described in the investment management literature provide for the deferring of capital gains with relatively little detrimental effect on fund performance. These qualitative inputs about a manager can serve as important supplemental information to the quantitative predictors of tax alpha we identify here. Proper due diligence can identify those managers who are assiduous in managing the tax implications of their investment decisions.

Even with rudimentary quantitative screens, we can identify tax-efficient active managers. We find that funds with lower turnover and lower dividend yields tend to be more tax efficient in the future. With less statistical significance, we find that smaller funds and funds that are not facing outflows may offer greater tax efficiency. We should be cautious about the low-yield component. History suggests that low-yield stocks underperform both high-yield and zero-yield stocks. These stocks are more likely to be expensive growth stocks. If investors are not careful, a lighter tax burden may be paired with a lower pretax return, and the benefit may cancel out, which can to some degree be mitigated by avoiding managers who invested in the most extravagantly priced growth stocks. If we want growth, a reliance on zero-yield stocks, and funds that favor them, may be a better choice.

THE ROLE OF TRADITIONAL PASSIVE STRATEGIES, SMART BETA, ETFS, AND BEYOND IN IMPROVING AFTER-TAX ALPHA

Although the main focus of this article is identifying tax-efficient investment options, investors should also understand the toll management fees take on alpha. In addition to taxation, management fees strongly detract from any alpha a manager generates. Therefore, selecting investment strategies and investing vehicles that reduce management fees increases an investor's ability to earn alpha net of all expenses.

Reducing the Impact of Fees

Barber, Odean, and Zheng [2005] showed with solid statistical significance that higher expenses are associated with worse performance. The logic—that it is hard to identify manager skill and that expenses detract from a manager's return—led to the birth of passive investing almost a half-century ago. Today, about $11 trillion in assets are invested in passive funds.[19] Bogle [1997] found that, after fees, passive managers were in the top quintile of active managers—and this was, by definition, with no stock selection skill!

When Jeffrey and Arnott [1993] published their findings on alpha and taxes 25 years ago, investors had only two options: invest in active funds or invest in capitalization-weighted passive index funds. The article roughly coincided with—and likely encouraged—the early growth of tax-advantaged investing, achieved through loss harvesting and other strategies aimed at shrinking tax alpha.[20] Arnott, Berkin, and Ye [2000] showed that tax-advantaged investing can reduce a fund's tax alpha. Since then, a new category of investment strategies—most commonly referred to as smart beta but also known as alternative beta or strategic beta—has emerged and combines some of the features of both passive and active strategies. Few funds are managed and marketed as explicitly tax advantaged, using the full toolkit of opportunities to reduce tax alpha. We explore whether smart beta strategies may offer a better path to after-tax alpha than either conventional active or passive strategies.

The term *smart beta* lacks a clear definition, but a broad definition might be any rules-based strategy seeking to deliver a well-documented source of alpha, implemented in a low-cost, transparent investment vehicle.

The original-definition smart beta is much narrower, excluding any strategies that allow a direct link between a stock's price and a stock's weight in the portfolio. Breaking the link between price and portfolio weight eliminates the inherent tendency of a cap-weighted portfolio, or index, to overweight overvalued stocks and underweight undervalued stocks. Regardless of definition, smart beta pairs the key active management goal of seeking to outperform the market, net of costs, with the passive management features of low cost and transparency. The combination allows investors to harness these benefits with low monitoring costs. These features have helped fuel the fast-growing popularity of smart beta.

We show the evolution of mutual fund expense ratios over the period 2007–2016 in Exhibit 6, Panel A. We categorize the funds as they are categorized in the Morningstar Direct database as active, passive, or smart beta (Morningstar uses the term *strategic beta*). The average expense ratio for active funds has declined by 10 bps (9%) from 112 bps in 2007 to about 102 bps in 2016. In the same period, the average expense ratio for the passive funds declined by 7 bps (an even larger 15% decline), from 46 bps to 39 bps. Where the costs were already low, the fee pressure has been higher.

At the end of 2016, the average expense ratio of the smart beta funds was about 20 bps higher than the average expense ratio of the passive funds, and the funds in the smart beta category did not experience a fee decline over the decade like the active and passive fund categories did. In fact, from 2008 to 2014, the average fee for smart beta strategies was rising, possibly because of the lack of industry alignment around the smart beta definition and some active funds rebranding themselves as smart beta to ride the wave of industry interest in the category.

When we examine the distribution of fund expense ratios within each category, we observe stark differences. As we see in Exhibit 6, Panel B, most (65%) of the active mutual funds have expense ratios in the range of 76 to 125 bps, whereas most of the passive index funds (73%) have expense ratios below 50 bps. In the smart beta category, 62% of the funds have costs below 50 bps, whereas 23% have costs above 100 bps and thus display a bimodal character. For the smart beta funds with expense ratios under 100 bps, the frequency distribution of fund expenses is almost indistinguishable from those of the passive index funds.

Exhibit 6
Mutual Fund Expense Ratios

Panel A: Evolution of Fund Expenses by Morningstar Category, 2007–2016
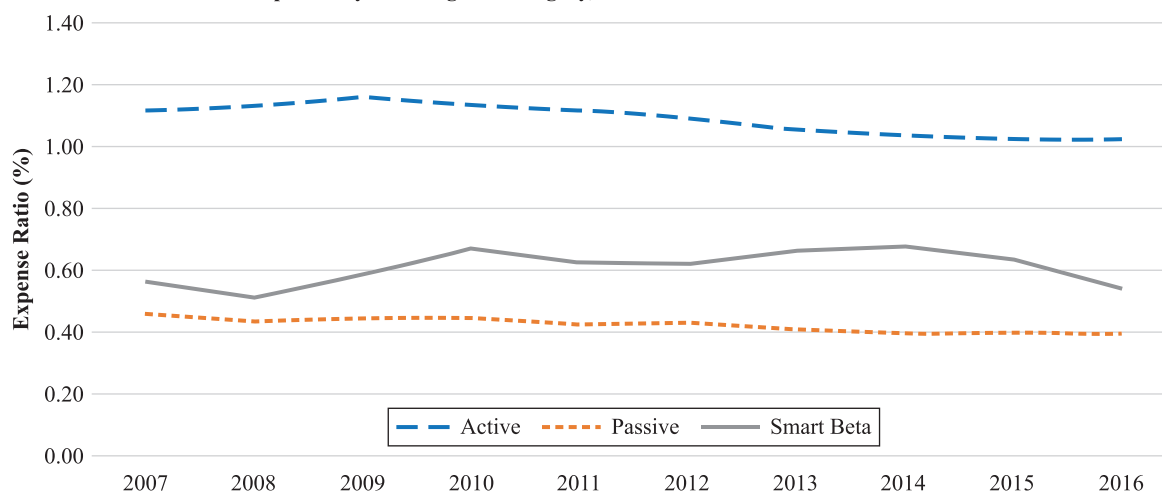
Panel B: Distribution of Fund Expenses by Morningstar Category, 2016
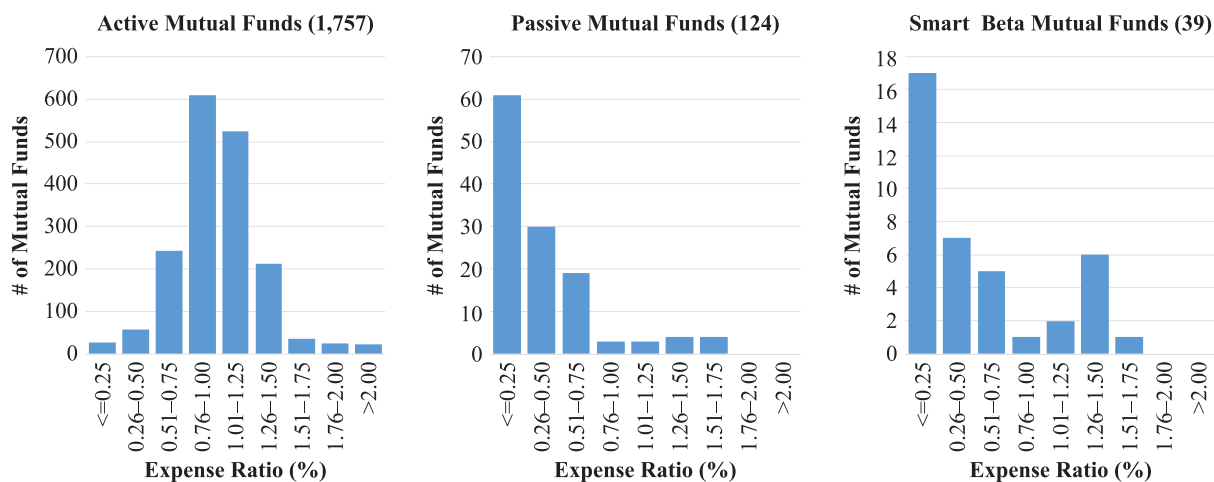
Note: Smart beta funds correspond to the Strategic Beta Morningstar classification.
Source: Research Affiliates, LLC, using data from Morningstar Direct.

We strongly suspect that many of the smart beta funds with expense ratios above 100 bps are rebranded active funds, suggesting that investors interested in smart beta strategies should look beyond the label (which is usually self-selected) to ensure the strategy possesses the characteristics of smart beta: low fees, transparent, and rules based. Investors should ask if the driver of the fund's return is based on academic research and, therefore, if it has the potential to outperform. For purists who want to hew to the original definition of smart

beta, the key question is: Does the portfolio construction method break the link between the weight of the stock in the portfolio and its price or market capitalization?

Reducing the Impact of Taxes

One of the most provocative findings of Jeffrey and Arnott [1993] was that over 95% of active managers underperformed the capitalization-weighted index fund on an after-tax basis. This was—mistakenly, in our

view—taken as an indictment of active management from the standpoint of the taxable investor. As Jeffrey and Arnott stated, the problem was not so much a failure of active managers as a failure of active managers to take full account of the tax consequences of their trading decisions. Today, this leads to an interesting question. After having a quarter century to digest the lessons of Jeffrey and Arnott, have we made any progress? How do the active, passive, and smart beta funds in the market today compare in terms of after-tax alpha?

Disappointingly, our findings show that active managers still struggle to deliver alpha in excess of their fees and taxes—very much in line with Jeffrey and Arnott's quarter-century-old finding. The 25-year period studied in Exhibit 7, Panel A, shows the excess return of funds relative to the gross returns of their style benchmarks. Even before fees and taxes, the average active manager shows slight underperformance of the stated benchmark by −0.3% per annum. Active funds run into real trouble when fees and taxes are taken into account: Their fees are higher, and so are their taxes which are triggered by higher trading—net of fees and taxes they end up 3.5% below their style benchmarks' gross average annualized return. Passive funds also lag their style benchmarks by an average of 1.7% (the venerable Vanguard 500 also underperforms the S&P 500 by 1.3% per annum). Indeed, almost all categories fail to beat the pretax S&P 500, once fees and taxes have taken their toll.

Most investors compound the problem with a performance-chasing mentality, dropping funds and managers that have disappointed and pouring money into funds and managers that have performed brilliantly in recent years. Kinnel's "Mind the Gap" series [2005, 2014, 2015, 2016] showed that investors' mistiming of purchases and sales costs them anywhere from a few dozen basis points to several hundred basis points over a typical 10-year window, depending on the fund category. For a tax-sensitive investor, the shortfall will be even larger because selling in one fund and investing in the other typically triggers capital gain realization.

Both in the full 25-year period as well as over the past 10 years, however, smart beta funds have done a suitable job generating an "alpha big enough to cover their taxes"—an admittedly tall task. In the full 25-year period, smart beta funds underperformed the gross return of their style benchmarks by 0.9%, which is 0.8% ahead of the passive options and 2.6% ahead of active

funds. Maybe there is a better mousetrap, after all. As Exhibit 7, Panel B, shows, in our analysis of surviving funds over the period 2008–2017, smart beta funds earned gross-of-fee excess returns of 1.2%, or about 0.5% better than active funds. On a net-of-fees basis, smart beta funds extended their lead over active funds, keeping 0.6% in excess return compared to active funds' underperforming by 0.4%. Smart beta funds' fee advantage over active funds is likely a result of their more efficient investment process, which, by most definitions, is mechanical, rules based, and absent of too much human intervention.

The lower costs of running a smart beta fund translate into a lower expense ratio for the investor. Many smart beta funds are constructed to have only modest levels of trading, which leads to lower turnover, the realization of fewer capital gains, and a lower tax liability. It is not until after fees and taxes on capital gains and dividends that smart beta funds start to underperform the gross return of their benchmark, delivering a −0.1% after-tax preliquidation return. Though negative, we should still consider this a relative win when compared to active funds and passive funds, which posted returns of −1.5% and −0.5%, respectively.

The superior tax efficiency of the smart beta and passive funds in our analysis is achieved by deferring taxes. This deferred tax liability comes due when the investor sells the fund and underlying stocks are liquidated. The effect of this liquidation is shown in Exhibit 7, Panel B, as the difference between the after-tax (preliquidation) and after-tax (postliquidation) returns. Active funds, which defer less taxes on average, make up some ground on smart beta funds and passive funds postliquidation by only losing an additional 0.4% to their benchmark. Smart beta and passive funds, which have more capital gains with which to pay taxes on postliquidation, lose an additional 0.9% and 0.8%, respectively, to their benchmarks. The final result is that smart beta funds underperform the benchmark by 1.0% per annum after all fees and taxes over the 10-year period. This compares favorably to passive funds (which underperform by 1.3%) and active funds (which underperform by 1.9%).

Smart beta funds are not a homogenous group, as the variation in the excess returns of the underlying fund types included in Exhibit 7, Panel B, demonstrates. Funds with low volatility (or other similar keywords) underperformed the benchmark by almost 3%, whereas

Exhibit 7
Average Fund Performance, United States

Fund Type	No. of Funds (No. of ETFs)		Annualized Excess Return				Annualized FF4 Alpha			
			Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)
Panel A: Fund Performance by Fund Type, All Funds, 1993–2017										
All Funds	4,254	(354)	−0.2%	−1.4%	−2.7%	−3.2%	−0.3%	−1.4%	−2.4%	−2.9%
Mutual Funds	3,900	(0)	−0.3%	−1.5%	−2.9%	−3.4%	−0.3%	−1.5%	−2.5%	−3.0%
ETFs	354	(354)	0.3%	−0.1%	−0.4%	−1.1%	−0.2%	−0.8%	−0.8%	−1.5%
Active	3,704	(31)	−0.3%	−1.6%	−3.0%	−3.5%	−0.3%	−1.6%	−2.6%	−3.1%
Passive	338	(151)	0.1%	−0.4%	−1.0%	−1.7%	−0.2%	−0.8%	−1.3%	−1.9%
Vanguard 500	*1*	*(0)*	*0.1%*	*−0.1%*	*−0.6%*	*−1.3%*	*0.1%*	*−0.1%*	*−0.6%*	*−1.3%*
All Others	*337*	*(151)*	*0.1%*	*−0.4%*	*−1.0%*	*−1.7%*	*−0.2%*	*−0.8%*	*−1.3%*	*−1.9%*
Factor	3,022	(180)	−0.1%	−1.1%	−2.3%	−2.8%	−0.4%	−1.4%	−2.3%	−2.9%
Large	*488*	*(34)*	*−0.2%*	*−1.3%*	*−2.3%*	*−2.8%*	*−0.5%*	*−1.7%*	*−2.4%*	*−2.9%*
Small	*703*	*(44)*	*0.7%*	*−0.5%*	*−2.0%*	*−2.5%*	*−0.3%*	*−1.5%*	*−2.6%*	*−3.1%*
Growth	*1,031*	*(43)*	*−0.5%*	*−1.8%*	*−3.3%*	*−3.6%*	*−0.5%*	*−1.8%*	*−2.9%*	*−3.4%*
Value	*770*	*(43)*	*0.1%*	*−1.1%*	*−2.4%*	*−2.9%*	*0.0%*	*−1.1%*	*−2.0%*	*−2.5%*
Quality	*22*	*(9)*	*−0.1%*	*−1.1%*	*−1.7%*	*−2.3%*	*0.3%*	*−0.6%*	*−1.2%*	*−1.8%*
Momentum	*8*	*(7)*	*−0.5%*	*−1.1%*	*−2.1%*	*−2.7%*	*−1.5%*	*−1.9%*	*−2.8%*	*−3.4%*
Smart Beta	84	(59)	1.2%	0.5%	−0.3%	−0.9%	0.6%	−0.1%	−0.9%	−1.6%
Multifactor	*32*	*(27)*	*0.6%*	*0.1%*	*−0.6%*	*−1.3%*	*−0.2%*	*−0.7%*	*−1.6%*	*−2.3%*
Equal Weight	*12*	*(11)*	*1.1%*	*0.4%*	*0.1%*	*−0.7%*	*1.0%*	*0.4%*	*0.2%*	*−0.5%*
Low Vol/Min-Var	*29*	*(16)*	*0.4%*	*−0.6%*	*−1.6%*	*−2.2%*	*0.5%*	*−0.6%*	*−1.6%*	*−2.2%*
Fundamental Index	*11*	*(5)*	*2.8%*	*2.2%*	*1.0%*	*0.5%*	*1.0%*	*0.5%*	*−0.7%*	*−1.3%*
Panel B: Fund Performance by Fund Type, Surviving Funds, 2008–2017										
All Funds	1,494	(124)	0.7%	−0.3%	−1.3%	−1.8%	0.0%	−0.9%	−1.9%	−2.4%
Mutual Funds	1,370	(0)	0.7%	−0.4%	−1.4%	−1.9%	0.0%	−1.0%	−2.0%	−2.5%
ETFs	124	(124)	0.8%	0.4%	0.1%	−1.0%	0.4%	0.0%	−0.2%	−1.3%
Active	1,268	(1)	0.7%	−0.4%	−1.5%	−1.9%	−0.1%	−1.1%	−2.1%	−2.5%
Passive	123	(39)	0.6%	0.2%	−0.5%	−1.3%	0.2%	−0.2%	−0.8%	−1.7%
Vanguard 500	*1*	*(0)*	*0.0%*	*−0.1%*	*−0.5%*	*−1.5%*	*0.0%*	*−0.1%*	*−0.5%*	*−1.5%*
All Others	*122*	*(39)*	*0.6%*	*0.2%*	*−0.5%*	*−1.3%*	*0.2%*	*−0.2%*	*−0.8%*	*−1.7%*
Factor	1,118	(67)	0.4%	−0.6%	−1.4%	−2.0%	−0.4%	−1.3%	−2.0%	−2.7%
Large	*158*	*(11)*	*0.8%*	*−0.1%*	*−1.1%*	*−1.6%*	*−0.2%*	*−1.0%*	*−1.9%*	*−2.4%*
Small	*296*	*(14)*	*1.3%*	*0.1%*	*−1.0%*	*−1.5%*	*0.1%*	*−1.0%*	*−2.0%*	*−2.5%*
Growth	*337*	*(18)*	*1.1%*	*0.0%*	*−1.1%*	*−1.6%*	*−0.2%*	*−1.2%*	*−2.2%*	*−2.7%*
Value	*317*	*(20)*	*0.6%*	*−0.4%*	*−1.4%*	*−1.9%*	*−0.1%*	*−1.0%*	*−2.0%*	*−2.5%*
Quality	*8*	*(2)*	*0.2%*	*−0.8%*	*−1.3%*	*−2.1%*	*−0.2%*	*−1.1%*	*−1.6%*	*−2.3%*
Momentum	*2*	*(2)*	*−1.8%*	*−2.5%*	*−2.6%*	*−3.7%*	*−1.8%*	*−2.4%*	*−2.5%*	*−3.5%*
Smart Beta	28	(17)	1.2%	0.6%	−0.1%	−1.0%	0.5%	−0.1%	−0.5%	−1.4%
Multifactor	*11*	*(10)*	*1.3%*	*0.6%*	*0.3%*	*−0.8%*	*0.5%*	*−0.1%*	*−0.4%*	*−1.5%*
Equal Weight	*6*	*(5)*	*0.7%*	*0.2%*	*0.0%*	*−1.1%*	*0.1%*	*−0.3%*	*0.0%*	*−1.1%*
Low Vol/Min-Var	*6*	*(0)*	*−0.3%*	*−1.1%*	*−2.2%*	*−2.8%*	*0.6%*	*−0.2%*	*−0.9%*	*−1.6%*
Fundamental Index	*5*	*(2)*	*3.0%*	*2.5%*	*1.3%*	*0.5%*	*0.9%*	*0.4%*	*−0.8%*	*−1.6%*

Source: Research Affiliates, LLC, using data from Morningstar Direct.

multifactor, equal weight, and Fundamental Index funds delivered −0.8%, −1.1%, and 0.5% of excess returns, respectively.

Our analysis of excess returns in Panel B, covering the period 2008–2017, comes with one glaring caveat: It takes place over a period when value was savaged. By calculating the excess returns of funds relative to their style benchmark, we believe we at least partially solve for styles being in or out of favor. However, to further test this, we calculate each fund's Fama–French plus momentum four-factor alpha (FF4). When we switch to the FF4 analysis (reported in the four rightmost columns in Exhibit 7), we confirm the results of our excess return analysis. After all fees and taxes, smart beta strategies have alphas that are on average 0.3% higher than passive funds and 1.1% higher than active funds.

Smart beta funds also benefited from the structure of the investment vehicles through which they invested. ETFs composed 61% of smart beta funds and only one (0%) active fund in our 10-year analysis. The disproportionate number of smart beta strategies delivered through ETFs—which have lower costs and greater tax efficiency—benefited from the added tailwind of superior returns, net of all fees and taxes, relative to active funds.

A new breed of investment funds known as smart beta offers a means by which investors and investment managers can reduce the performance drag of tax alpha resulting from management fees and taxes because smart beta strategies are able to systematically capture excess returns without charging high fees and by trading in a relatively tax-efficient manner.

ETFs and Beyond

From the perspective of a taxable investor, the ETF is arguably the most important innovation over the last quarter century. Smart beta, at least in its narrow original definition, may turn out to be a close second. Two other means of increasing tax efficiency, which we have chosen not to explore in this article, bear mention as key innovations for taxable investors in the last 25 years. These are long-dated swaps and robo-advisors. Long-dated swaps (366 days or longer) can be a powerful tool for shifting taxable alpha (or even the total return) out of ordinary income and short-

term capital gains rates into the more favorable rates for long-term capital gains. Robo-advisors often have fully automated tax-loss harvesting, strategies human advisors follow less dependably and with varying degrees of skill.

Another investment vehicle with relatively high tax efficiency is an ETN. An ETN is essentially a debt obligation of the issuing bank and is linked to an index. The ETN structure does not hold securities in which trading could trigger a tax liability. When the ETN matures, a cash payment is made to the ETN investor, which is typically taxed as a long–term capital gain.[21] If the ETN is collateralized by a taxable bond portfolio, it may, however, serve to increase the investor's tax bill, not reduce it.

A separately managed account (SMA), or segregated account, tends to be less tax efficient than an ETN but has the potential to be more tax efficient than a mutual fund or an ETF. Like an ETF, an SMA is unaffected by flows from other investors and has the flexibility to realize the full spectrum of techniques aimed at deferring tax liability, if only the portfolio manager would apply the toolkit of the tax-advantaged investor.

Let's focus our attention on ETFs. Like a mutual fund, an ETF is a regulated investment company registered under the Investment Company Act of 1940, and the tax treatment applied to both is largely the same. The main difference between the two is the way flows into and out of the fund are handled. In a mutual fund, when a manager sells assets to meet redemptions and triggers capital gains, all investors in the fund are affected. In an ETF, the manager creates a liquidation unit of in–kind assets (stocks, not cash) removed from the fund before being liquidated so that only the seller faces the tax consequences of capital gains.

On average, an ETF has lower management fees than do active mutual funds; in most cases, the fees are similar to those of passive funds, or a bit higher, and often track an index that has relatively low turnover. Both of these factors can further boost an ETF's after-tax alpha, well beyond that of similar mutual funds.

Importantly, investors can use the rich toolkit of tax-advantaged investing available with ETFs. An ETF trades just like an individual stock, so loss harvesting, lot selection, and other tax management strategies can be applied to ETFs in essentially the same way as in

EXHIBIT 8
Average Tax Consequences for ETFs and Mutual Funds, 1993–2017

Panel A: Average Annual Capital Gains Tax Burden, by Fund Type

	% of Funds			
Fund Type	No CG Distributions	0%–1% Burden	>1% Burden	Average Burden
Mutual Fund	4.9%	54.9%	40.2%	0.9%
ETF	53.3%	46.7%	0.0%	0.0%

Panel B: Average Annual Capital Gains and Dividend Tax Burden, by Fund Type

	% of Funds			
Fund Type	No CG or Div Distributions	0%–1% Burden	>1% Burden	Average Burden
Mutual Fund	2.3%	48.9%	48.8%	1.1%
ETF	5.3%	94.4%	0.3%	0.3%

Source: Research Affiliates, LLC, using data by Morningstar Direct.

an equity portfolio. For example, if a holding in SPY (the SPDR S&P 500 portfolio) is under water, why not trade out of SPY and into IVV (the iShares S&P 500 portfolio)? The tax loss realized can then be used to offset capital gains realized elsewhere in the investor's portfolio, reducing the investor's overall tax bill.

Exhibit 8 highlights the tax efficiency of ETFs, which is, unfortunately, wasted on most investors, who value ETFs primarily as trading vehicles because they offer intraday trading, in most cases at very low cost. The buy-and-hold investor benefits most from the tax efficiency of ETFs because fund inflows and outflows occur by means of in-kind creation and liquidation units, which shields shareholders from taxes imposed by other investors' purchase and sale decisions.

Panel A shows that across all ETFs in the Morningstar Direct database, which had at least two years of history within the 25-year period from 1993 through 2017, over half (53.3%) had made no capital gains distributions in the history of the ETF. The distributions, from ETFs required to make capital gains distributions, were so small that the average tax burden for ETFs rounded to zero! By contrast, over the same period, only 4.9% of mutual funds had made no capital gains distributions. The capital gains distributions made by mutual funds imposed a tax burden on their share-

holders of an average 0.9% per annum. To trigger a 1% tax burden on the investor, a fund must pay out around 3% of its net asset value in capital gains distributions. Ironically, investors, financial advisors, and mutual fund data vendors often obsess over a difference in management fees as small as 5 or 10 bps, while often ignoring the less obvious costs of, for example, taxes and trading costs, which can be an order of magnitude larger. If one fund charges 5 bps less than another but triggers an average tax bill 100 bps higher, the former represents a fool's bargain.

Panel B hints at another possible edge for ETFs. When we include dividend distributions along with capital gains, the average tax burden is 1.1% for mutual funds and 0.3% for ETFs. These figures are, respectively, 0.2% and 0.3% higher than the average tax burden of capital gains distributions alone. Because the taxation of dividends in ETFs is a little higher, on average, than in mutual funds, ETFs appear to have a cost structure that permits larger dividend distributions when compared to mutual funds.

The tax savings associated with ETFs compared to mutual funds is almost as good after paying taxes on both dividends and capital gains as with the tax on capital gains only. The tax benefit of the ETF structure is roughly 0.8% to 0.9% per annum. If even half of that savings is retained after the investor sells the ETF investment and pays the resulting long-term capital gains tax, the result is a tax savings of nearly half a percent. In a world of low-yielding stocks and bonds and frothy valuations in many markets, a reliable half-percent after-tax alpha might easily represent a 10% to 20% improvement in annualized long-term expected return. It is huge.

CONCLUSION

The investment industry aggressively seeks to control its most visible cost—management fees—while too often ignoring the less visible and relatively larger costs associated with trading and with the tax consequences of trading. As Jeffrey and Arnott [1993] argued, this misplaced emphasis causes active managers to poorly serve taxable investors. Because most managers pay too much attention to unreliable pretax alpha and too little attention to controllable tax costs, they are destined to fail the investors they serve. Managers can best serve their taxable investors when they recognize

that after-tax alpha from assiduous management of tax consequences goes hand in hand with the quest for pretax value-add.

Unfortunately, although the overall landscape remains bleak, the situation is changing fast for a growing roster of investors who are alert to the opportunities of harvesting both pretax alpha and an improved, reduced tax alpha. Most affluent investors are well aware that tax-advantaged investing strategies can systematically reduce their tax bill. That said, ETFs offer an advantageous 0.8%–0.9% in tax savings relative to mutual funds. To further reduce their tax bill, investors can use loss harvesting on a portfolio of ETFs as well as other strategies borrowed from the toolkit of tax-advantaged investing.

Smart beta strategies are another innovation that offers the promise of higher after-tax returns. In looking at the first-generation smart beta funds, equal weight, low volatility, minimum variance, and fundamental index, it appears they have delivered alpha relative to passive funds. This is particularly surprising given that value is a common denominator across most smart beta strategies, and value has been savaged in the past decade.

Funds with relatively lower turnover and lower dividend yield tend to generate lower tax-related expenses. Just as we can easily measure the tax consequences of the strategies in which we invest, we can predict, manage, and sharply reduce those tax consequences. For all of us who, like Ben Franklin, inevitably face death and taxes, we can delay, and partly avoid, the latter. More can and should be done by fund managers and vendors to help investors do so.

Appendix A

CALCULATION METHODS

- **Gross Return:** Gross returns are calculated by backing out the most recent net expense ratio from the net-of-fees return, spreading the expenses evenly over the year.
- **Net-of-Fees Return:** Expressed in percentage terms, net-of-fees return is determined each month by taking the change in monthly net asset value (NAV), reinvesting all income and capital gains distributions during that month, and dividing by the starting NAV. Reinvestments are made using the actual reinvestment NAV, and daily payoffs are reinvested monthly. Adjustments

are not made for sales charges (such as front-end loads, deferred loads, and redemption fees), which gives a clearer picture of a fund's performance. The returns do account for management, administrative, 12b-1 fees, and other costs deducted from fund assets. Returns for periods longer than one year are expressed in terms of compound average annual returns (also known as the geometric total return).

- **After-tax Preliquidation Return:** The net-of-fees return is calculated after taxes paid on capital gains and dividends during the period. The assumptions are as follows:

  1. The investor does not sell the fund holding at the end of the time period.
  2. Distributions are taxed at the highest prevailing federal tax rate and then reinvested.
  3. State and local taxes are excluded.

  This data point follows the guidelines established by the SEC in the spring of 2001 for reporting after-tax performance. In addition to the tax adjustment, the total return is reduced for the effects of sales loads per SEC recommendations.

- **After-tax Postliquidation Return:** The after-tax preliquidation return is reduced for taxes paid on capital gains that result from the liquidation of all holdings at the end of the time period. Funds that are alive longer have the opportunity to defer taxes longer and have annualized returns that are less affected by this liquidation haircut. To make an apples-to-apples comparison of these liquidation consequences, time horizons of compared funds should be equal to allow for a similar accumulation of return on the unrealized capital gains. We extend the life of nonsurviving funds by assuming investors are able to own the market benchmark fund during periods when the fund is not alive by essentially switching into or out of the market benchmark fund without realizing gains until the end of the time period. The difference between the extended after-tax postliquidation and extended after-tax preliquidation returns is the haircut that is then applied to the after-tax preliquidation return just described. The result after the haircut is the after-tax postliquidation return. We recognize that our approach potentially provides a slight improvement to the after-tax postliquidation return of active funds and other less-tax-efficient funds because it borrows some tax efficiency from the benchmark index fund. Furthermore, it assumes that an investor can switch from a passive to an active fund and back without realization of capital gains; this again

potentially underestimates the tax burden for the non-surviving funds.

- **Tax Burden:** The tax burden is the difference between the net-of-fees return and the after-tax return. The tax burden can be before or after the effect of liquidation taxes. The term is used interchangeably with tax alpha, but it is a more apt descriptor because tax alpha is almost always negative.
- **Exhibit 4:** The universe for this test is all active U.S. equity mutual funds that have at least two years of history. In the year-over-year regression, we include all funds, survivors and nonsurvivors. In the 10-year annualized regression we include surviving funds only.

For each of these tests, we measure results of two alternative measures of the tax burden: the tax burden as a decrement to the return, and the tax burden as a fraction of the net-of-fees return. For instance, if a fund has a 10% net-of-fees return, and taxes reduce that return to 8%, then the decrement to return is 2% and the fraction of return is 20% (i.e., 20% of the total return was paid to the IRS in taxes). In the year-over-year regression, the tax burden is the difference between the net-of-fees return and the after-tax preliquidation return. In the 10-year annualized regression, the tax burden is the difference between the net-of-fees return and the after-tax postliquidation return.

- *Year-over-Year Regression:* This regression is represented in the four leftmost column-pairs and occurs over two time horizons of 10 and 25 years. The dependent variable is the annual tax burden of each fund in our sample and is regressed against each independent variable for each fund in the same year. This is repeated year by year for 10 or 25 years, depending on the horizon tested.
- *10-Year Annualized Regression:* This regression is represented in the two rightmost column-pairs and occurs over 10 years. The dependent variable is the 10-year annualized tax burden of each fund in our sample. The independent variables are the averages of those variables over the 10-year horizon (e.g., fund size is the average fund size over the 10-year period measured as a simple average of the funds' AUM at the end of each year of the 10-year period). The independent and dependent variables are regressed against each other over one time period, the past 10 years.
- **Exhibit 7:** The universe for this table is all U.S. equity funds that have at least two years of history. We subdivide that universe into four primary groups: active, passive, factor, and smart beta funds. We use the Morningstar classification to determine which funds are active and which are passive. We use a keyword search to determine which funds are factor funds and which are smart beta funds.

- *Factor funds:* If the factor is in the name of a fund, it is included in that basket of funds. For example, a fund named Black Diamond Small Cap Value would be included in the small factor basket and in the value factor basket.
- *Smart beta funds:* Similar to factor funds, a keyword search is used to identify funds that are included in the different smart beta baskets. The exception are the multifactor funds. We use the Morningstar categorization of multifactor funds to identify which funds make it into the multifactor basket. The keywords for other smart beta baskets are

  - Equal Weight: Equal Weight, Equal Wt, Equally, and Equal Wg.
  - Low Vol/Min Var: Volatility, Low Vol, and Min Vol.
  - Fundamental Index: RAFI, RAE, Fundamental Index, and Schwab Fundamental.

Once baskets are created, we take an equally weighted average of the underlying funds in the basket to calculate the return of that basket. We then take an equally weighted average of each basket to determine the average return for factor funds and smart beta funds.

Annualized excess returns are calculated for each underlying fund as the difference between the geometrically annualized return of the fund for the time it was alive minus the geometrically annualized return of the fund's style benchmark over the same period. The style benchmarks that were used for each Morningstar category are as follows:

U.S. Fund Large Blend: S&P 500 Index
U.S. Fund Large Value: Russell 1000 Value Index
U.S. Fund Large Growth: Russell 1000 Growth Index
U.S. Fund Mid-Cap Blend: Russell Mid Cap Index
U.S. Fund Mid-Cap Value: Russell Mid Cap Value Index
U.S. Fund Mid-Cap Growth: Russell Mid Cap Growth Index
U.S. Fund Small Blend: Russell Small Cap Index
U.S. Fund Small Value: Russell Small Cap Value Index
U.S. Fund Small Growth: Russell Small Cap Growth Index

The annualized Fama–French plus momentum factor alphas are calculated by regressing the monthly returns (less the risk-free rate) of the underlying funds against four factors: size (SMB), value (HML), momentum (MOM), and market (S&P 500) kindly provided on the website of Kenneth French.

Appendix B

FUND TAX BURDEN

Exhibit B1

Predicting the Tax Burden of Active Mutual Funds, Year-over-Year for 25 Years, Year-over-Year for 10 Years, and 10 Years Ex Ante, Ending December 2017

	Preliquidation				Postliquidation	
Dependent Variables:	Fund/Year Tax Burden, 25-Year Period as		Fund/Year Tax Burden, 10-Year Period as		10-Yr Annualized Tax Burden, Surviving Funds as	
Independent Variables:	Decrement to Return	Fraction of Return	Decrement to Return	Fraction of Return	Decrement to Return	Fraction of Return
Intercept	1.33 **(11.88)**	15.94 **(10.04)**	1.69 **(14.33)**	12.89 **(7.05)**	0.01 (0.05)	17.85 **(17.75)**
Gross Return, Matching Period	1.15 **(9.36)**	−45.97 **(−26.52)**	0.30 (1.91)	−41.50 **(−16.70)**	16.60 **(26.43)**	−18.48 **(−2.82)**
Undistributed Capital Gains, Previous Year	1.77 **(15.91)**	21.71 **(13.83)**	−0.14 (−0.95)	11.02 **(4.84)**		
Turnover Ratio, Previous Year	0.18 **(10.71)**	0.20 (0.85)	0.10 **(5.43)**	0.19 (0.64)	0.09 **(5.60)**	0.74 **(4.19)**
Dividend Yield, Previous Year	1.67 (1.03)	67.81 **(2.98)**	3.13 (1.88)	62.83 **(2.42)**	3.08 **(2.09)**	32.64 **(2.12)**
Fund Size (Log (AUM))	0.02 (1.61)	0.49 **(2.91)**	0.01 (1.04)	0.49 **(2.51)**	0.05 **(5.57)**	0.66 **(7.00)**
Flows/AUM, Previous Year	−0.32 **(−14.88)**	−3.30 **(−11.01)**	−0.39 **(−14.58)**	−3.43 **(−8.31)**	−0.004 (−1.67)	−0.050 (−1.92)
Value-Growth Style, Morningstar Measure	−0.01 (−0.90)	−0.49 **(−2.77)**	0.04 **(2.78)**	1.17 **(5.72)**	−0.07 **(−6.02)**	−0.86 **(−7.25)**
Size Style, Morningstar Measure	−0.08 **(−7.85)**	−1.38 **(−9.10)**	−0.06 **(−5.30)**	−1.19 **(−6.79)**	0.04 **(2.80)**	0.45 **(3.41)**
Year Fixed Effects	Yes	Yes	Yes	Yes	No	No
R^2	0.77	0.48	0.28	0.39	0.40	0.14

Note: Bold T-Stats signify statistical significance at a 5% level (P value < 0.05).

Appendix C

AVERAGE FUND PERFORMANCE BY FUND TYPE

Exhibit C1

Average Fund Performance, United States

		Annualized Excess Returns				Annualized FF4 Alpha			
Fund Type	No. of Funds (No. of ETFs)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)
Panel A: Fund Performance by Fund Type, All Funds, 2008–2017									
All Funds	4,254 (354)	0.0%	−1.0%	−2.0%	−2.6%	−0.8%	−1.9%	−2.6%	−3.2%
Mutual Funds	3,900 (0)	−0.1%	−1.2%	−2.2%	−2.8%	−0.7%	−1.8%	−2.7%	−3.3%
ETFs	354 (354)	0.4%	0.0%	−0.3%	−1.3%	−2.2%	−2.9%	−0.9%	−2.0%
Active	3,704 (31)	−0.1%	−1.3%	−2.3%	−2.9%	−0.8%	−1.9%	−2.8%	−3.4%
Passive	338 (151)	0.6%	0.1%	−0.6%	−1.5%	−2.3%	−3.2%	−1.3%	−2.1%
Vanguard 500	*1 (0)*	*0.0%*	*−0.1%*	*−0.5%*	*−1.5%*	*0.0%*	*−0.1%*	*−0.5%*	*−1.5%*
All Others	*337 (151)*	*0.6%*	*0.1%*	*−0.6%*	*−1.5%*	*−2.3%*	*−3.2%*	*−1.3%*	*−2.1%*
Factor	3,022 (180)	0.2%	−0.7%	−1.5%	−2.2%	−0.6%	−1.6%	−2.3%	−3.0%
Large	*488 (34)*	*0.5%*	*−0.4%*	*−1.3%*	*−2.0%*	*−0.2%*	*−1.6%*	*−2.7%*	*−3.3%*
Small	*703 (44)*	*0.3%*	*−0.8%*	*−1.7%*	*−2.4%*	*−1.0%*	*−2.1%*	*−2.7%*	*−3.4%*
Growth	*1,031 (43)*	*−0.1%*	*−1.2%*	*−2.1%*	*−2.7%*	*−0.7%*	*−2.0%*	*−3.4%*	*−4.0%*
Value	*770 (43)*	*0.2%*	*−0.9%*	*−1.9%*	*−2.5%*	*−1.0%*	*−2.1%*	*−2.3%*	*−2.9%*
Quality	*22 (9)*	*0.2%*	*−0.7%*	*−1.2%*	*−2.0%*	*0.2%*	*−0.5%*	*−1.1%*	*−1.9%*
Momentum	*8 (7)*	*0.1%*	*−0.4%*	*−0.6%*	*−1.7%*	*−0.8%*	*−1.3%*	*−1.4%*	*−2.4%*

(continued)

Average Fund Performance, United States

Fund Type	No. of Funds (No. of ETFs)		Annualized Excess Returns				Annualized FF4 Alpha			
			Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)
Smart Beta	84	(59)	1.1%	0.5%	−0.3%	−1.2%	0.3%	−0.2%	−0.9%	−1.7%
Multifactor	*32*	*(27)*	*0.8%*	*0.3%*	*−0.3%*	*−1.3%*	*−0.3%*	*−0.8%*	*−1.7%*	*−2.6%*
Equal Weight	*12*	*(11)*	*0.7%*	*0.2%*	*0.0%*	*−1.1%*	*0.1%*	*−0.3%*	*0.0%*	*−1.1%*
Low Vol/Min-Var	*29*	*(16)*	*−0.3%*	*−1.1%*	*−2.2%*	*−2.8%*	*0.6%*	*−0.2%*	*−0.9%*	*−1.6%*
Fundamental Index	*11*	*(5)*	*3.0%*	*2.5%*	*1.3%*	*0.5%*	*0.9%*	*0.4%*	*−0.8%*	*−1.6%*
Panel B: Fund Performance by Fund Type, Surviving Funds, 1993–2017										
All Funds	375	(0)	0.5%	−0.7%	−2.6%	−3.0%	0.6%	−0.4%	−1.8%	−2.1%
Active	348	(0)	0.5%	−0.7%	−2.8%	−3.1%	0.6%	−0.4%	−1.9%	−2.2%
Passive	25	(0)	0.2%	−0.2%	−1.2%	−1.7%	0.1%	−0.3%	−1.3%	−1.8%
Vanguard 500	*1*	*(0)*	*0.1%*	*−0.1%*	*−0.6%*	*−1.3%*	*0.1%*	*−0.1%*	*−0.6%*	*−1.3%*
All Others	*24*	*(0)*	*0.2%*	*−0.2%*	*−1.3%*	*−1.7%*	*0.1%*	*−0.3%*	*−1.3%*	*−1.8%*
Factor	230	(0)	0.6%	−0.7%	−2.1%	−2.4%	0.5%	−0.5%	−1.9%	−2.2%
Large	*35*	*(0)*	*0.2%*	*−1.0%*	*−2.4%*	*−2.7%*	*0.2%*	*−0.9%*	*−2.3%*	*−2.5%*
Small	*45*	*(0)*	*1.6%*	*0.3%*	*−1.2%*	*−1.5%*	*0.6%*	*−0.6%*	*−2.0%*	*−2.3%*
Growth	*94*	*(0)*	*0.6%*	*−0.6%*	*−1.9%*	*−2.2%*	*0.5%*	*−0.6%*	*−1.9%*	*−2.2%*
Value	*54*	*(0)*	*0.3%*	*−0.9%*	*−2.5%*	*−2.8%*	*0.6%*	*−0.4%*	*−2.0%*	*−2.2%*
Quality	*2*	*(0)*	*0.1%*	*−1.4%*	*−2.6%*	*−3.0%*	*0.8%*	*−0.2%*	*−1.6%*	*−2.0%*
Momentum	*0*	*(0)*	*−*	*−*	*−*	*−*	*−*	*−*	*−*	*−*

E X H I B I T C 2

Average Fund Performance, All Funds, United States

Fund Type	No. of Funds (No. of ETFs)		Annualized Returns				Annualized CAPM Alpha			
			Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)
Panel A: Fund Performance by Fund Type, Returns, and Capital Asset Pricing Model Alphas, 1993–2017										
All Funds	4,254	(354)	7.6%	6.3%	5.1%	4.6%	0.4%	−0.8%	−1.8%	−2.3%
Mutual Funds	3,900	(0)	7.5%	6.1%	4.8%	4.3%	0.4%	−0.7%	−1.9%	−2.4%
ETFs	354	(354)	8.9%	8.7%	8.4%	7.7%	−0.1%	−0.8%	−0.6%	−1.3%
Active	3,704	(31)	7.4%	6.0%	4.7%	4.2%	0.4%	−0.8%	−2.0%	−2.4%
Passive	338	(151)	6.9%	6.6%	6.0%	5.3%	0.5%	−0.3%	−0.4%	−1.1%
Vanguard 500	*1*	*(0)*	*9.8%*	*9.6%*	*9.1%*	*8.4%*	*0.1%*	*−0.1%*	*−0.6%*	*−1.3%*
All Others	*337*	*(151)*	*6.9%*	*6.6%*	*6.0%*	*5.3%*	*0.5%*	*−0.3%*	*−0.4%*	*−1.1%*
Factor	3,022	(180)	8.6%	7.5%	6.4%	5.8%	0.2%	−0.9%	−1.7%	−2.3%
Large	*488*	*(34)*	*6.8%*	*5.6%*	*4.7%*	*4.1%*	*−0.2%*	*−1.3%*	*−2.2%*	*−2.7%*
Small	*703*	*(44)*	*8.7%*	*7.6%*	*6.2%*	*5.6%*	*1.0%*	*0.0%*	*−1.1%*	*−1.5%*
Growth	*1,031*	*(43)*	*6.8%*	*5.2%*	*3.8%*	*3.5%*	*0.0%*	*−1.2%*	*−2.3%*	*−2.7%*
Value	*770*	*(43)*	*8.1%*	*6.8%*	*5.6%*	*5.1%*	*1.0%*	*−0.1%*	*−1.3%*	*−1.8%*
Quality	*22*	*(9)*	*10.4%*	*9.5%*	*8.8%*	*8.3%*	*0.0%*	*−0.8%*	*−1.5%*	*−2.0%*
Momentum	*8*	*(7)*	*10.8%*	*10.1%*	*9.1%*	*8.5%*	*−0.4%*	*−1.6%*	*−2.0%*	*−2.7%*

(continued)

Average Fund Performance, All Funds, United States

Fund Type	No. of Funds (No. of ETFs)		Annualized Returns				Annualized CAPM Alpha			
			Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)
Smart Beta	84	(59)	10.6%	9.9%	9.1%	8.4%	0.1%	−0.8%	−1.4%	−2.0%
Multifactor	*32*	*(27)*	*11.8%*	*11.2%*	*10.6%*	*9.9%*	*−0.9%*	*−1.5%*	*−2.0%*	*−2.7%*
Equal Weight	*12*	*(11)*	*10.9%*	*10.2%*	*9.9%*	*9.1%*	*0.5%*	*−0.1%*	*−0.4%*	*−1.2%*
Low Vol/Min-Var	*29*	*(16)*	*9.0%*	*7.9%*	*6.8%*	*6.2%*	*0.6%*	*−1.0%*	*−1.6%*	*−2.2%*
Fundamental Index	*11*	*(5)*	*10.7%*	*10.2%*	*9.1%*	*8.5%*	*0.1%*	*−0.5%*	*−1.4%*	*−2.0%*
Panel B: Fund Performance by Fund Type, Returns, and CAPM Alphas, 2008–2017										
All Funds	4,254	(354)	3.5%	2.4%	1.6%	1.0%	−0.3%	−1.4%	−1.6%	−2.2%
Mutual Funds	3,900	(0)	2.9%	1.7%	0.9%	0.3%	−0.2%	−1.3%	−1.7%	−2.3%
ETFs	354	(354)	9.2%	8.9%	8.6%	7.6%	−1.9%	−2.8%	−0.6%	−1.6%
Active	3,704	(31)	2.9%	1.7%	0.9%	0.3%	−0.3%	−1.4%	−1.8%	−2.4%
Passive	338	(151)	4.5%	4.3%	3.7%	2.8%	−1.4%	−2.4%	−0.3%	−1.2%
Vanguard 500	*1*	*(0)*	*8.5%*	*8.4%*	*8.0%*	*7.0%*	*0.0%*	*−0.1%*	*−0.5%*	*−1.5%*
All Others	*337*	*(151)*	*4.5%*	*4.3%*	*3.7%*	*2.8%*	*−1.4%*	*−2.4%*	*−0.3%*	*−1.2%*
Factor	3,022	(180)	5.9%	5.0%	4.3%	3.5%	−0.3%	−1.4%	−1.4%	−2.1%
Large	*488*	*(34)*	*3.4%*	*2.6%*	*1.7%*	*1.1%*	*−0.7%*	*−1.9%*	*−2.2%*	*−2.9%*
Small	*703*	*(44)*	*4.6%*	*3.4%*	*2.5%*	*1.9%*	*−0.1%*	*−1.3%*	*−0.9%*	*−1.6%*
Growth	*1,031*	*(43)*	*1.4%*	*0.2%*	*−0.5%*	*−1.2%*	*−0.7%*	*−1.9%*	*−1.6%*	*−2.3%*
Value	*770*	*(43)*	*3.9%*	*2.7%*	*1.7%*	*1.1%*	*−0.4%*	*−1.5%*	*−1.8%*	*−2.4%*
Quality	*22*	*(9)*	*10.1%*	*9.2%*	*8.6%*	*7.8%*	*0.2%*	*−0.6%*	*−1.1%*	*−1.9%*
Momentum	*8*	*(7)*	*12.2%*	*11.7%*	*11.6%*	*10.5%*	*0.0%*	*−1.4%*	*−0.6%*	*−1.7%*
Smart Beta	84	(59)	11.2%	10.7%	9.9%	9.0%	0.0%	−0.8%	−1.2%	−2.0%
Multifactor	*32*	*(27)*	*11.6%*	*11.1%*	*10.5%*	*9.5%*	*−0.8%*	*−1.3%*	*−1.9%*	*−2.9%*
Equal Weight	*12*	*(11)*	*11.6%*	*11.1%*	*10.8%*	*9.8%*	*−0.8%*	*−1.2%*	*−1.0%*	*−2.0%*
Low Vol/Min-Var	*29*	*(16)*	*11.4%*	*10.6%*	*9.6%*	*8.9%*	*1.1%*	*−0.5%*	*−0.6%*	*−1.3%*
Fundamental Index	*11*	*(5)*	*10.4%*	*9.8%*	*8.7%*	*7.9%*	*0.4%*	*−0.1%*	*−1.2%*	*−2.0%*

Source: Research Affiliates, LLC, using data from Morningstar Direct.

E x h i b i t C 3

Average Fund Performance, Surviving Funds, United States

Fund Type	No. of Funds (No. of ETFs)		Annualized Returns				Annualized CAPM Alpha			
			Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)
Panel A: Fund Performance by Fund Type, Returns, and Capital Asset Pricing Model Alphas, 1993–2017										
All Funds	375	(0)	10.4%	9.4%	7.4%	7.0%	1.1%	0.2%	−1.3%	−1.6%
Active	348	(0)	10.5%	9.4%	7.3%	7.0%	1.1%	0.2%	−1.3%	−1.6%
Passive	25	(0)	9.9%	9.8%	8.5%	8.0%	0.5%	0.1%	−0.9%	−1.4%
Vanguard 500	*1*	*(0)*	*9.8%*	*9.6%*	*9.1%*	*8.4%*	*0.1%*	*−0.1%*	*−0.6%*	*−1.3%*
All Others	*24*	*(0)*	*9.9%*	*9.8%*	*8.5%*	*8.0%*	*0.5%*	*0.1%*	*−0.9%*	*−1.4%*

(continued)

Average Fund Performance, Surviving Funds, United States

Fund Type	No. of Funds (No. of ETFs)		Annualized Returns				Annualized CAPM Alpha			
			Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)
Factor	230	(0)	10.3%	9.3%	7.8%	7.5%	1.2%	0.2%	−1.3%	−1.6%
Large	*35*	*(0)*	*9.7%*	*8.9%*	*7.3%*	*7.1%*	*0.5%*	*−0.5%*	*−1.9%*	*−2.2%*
Small	*45*	*(0)*	*11.4%*	*10.2%*	*8.6%*	*8.3%*	*2.2%*	*1.1%*	*−0.5%*	*−0.8%*
Growth	*94*	*(0)*	*10.2%*	*9.2%*	*7.9%*	*7.6%*	*0.7%*	*−0.3%*	*−1.6%*	*−1.9%*
Value	*54*	*(0)*	*10.6%*	*9.7%*	*7.8%*	*7.6%*	*1.6%*	*0.7%*	*−1.0%*	*−1.3%*
Quality	*2*	*(0)*	*9.4%*	*8.8%*	*7.4%*	*7.0%*	*0.8%*	*−0.1%*	*−1.6%*	*−2.0%*
Momentum	*0*	*(0)*	*–*	*–*	*–*	*–*	*–*	*–*	*–*	*–*

Panel B: Fund Performance by Fund Type, Returns, and Capital Asset Pricing Model Alphas, 2008–2017

Fund Type	No. of Funds (No. of ETFs)		Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)	Gross-of-Fees	Net-of-Fees	After-Tax (Pre-Liq)	After-Tax (Post-Liq)
All Funds	1,494	(124)	9.3%	8.0%	7.2%	6.7%	0.2%	−0.7%	−1.7%	−2.2%
Mutual Funds	1,370	(0)	9.3%	7.9%	7.1%	6.6%	0.2%	−0.7%	−1.8%	−2.3%
ETFs	124	(124)	9.2%	8.8%	8.5%	7.4%	0.4%	0.0%	−0.2%	−1.3%
Active	1,268	(1)	9.3%	7.9%	7.0%	6.6%	0.2%	−0.8%	−1.9%	−2.3%
Passive	123	(39)	9.3%	8.7%	8.2%	7.4%	0.3%	−0.1%	−0.7%	−1.6%
Vanguard 500	*1*	*(0)*	*8.5%*	*8.4%*	*8.0%*	*7.0%*	*0.0%*	*−0.1%*	*−0.5%*	*−1.5%*
All Others	*122*	*(39)*	*9.3%*	*8.7%*	*8.2%*	*7.4%*	*0.3%*	*−0.1%*	*−0.7%*	*−1.6%*
Factor	1,118	(67)	8.8%	7.7%	7.0%	6.4%	0.0%	−0.9%	−1.7%	−2.3%
Large	*158*	*(11)*	*8.8%*	*7.7%*	*6.9%*	*6.4%*	*0.0%*	*−0.8%*	*−1.7%*	*−2.2%*
Small	*296*	*(14)*	*9.8%*	*8.5%*	*7.5%*	*7.0%*	*0.3%*	*−0.7%*	*−1.8%*	*−2.3%*
Growth	*337*	*(18)*	*9.7%*	*8.3%*	*7.5%*	*6.9%*	*0.6%*	*−0.4%*	*−1.4%*	*−1.9%*
Value	*317*	*(20)*	*8.8%*	*7.5%*	*6.6%*	*6.2%*	*−0.4%*	*−1.3%*	*−2.3%*	*−2.8%*
Quality	*8*	*(2)*	*8.2%*	*7.3%*	*6.7%*	*6.0%*	*0.0%*	*−0.9%*	*−1.4%*	*−2.1%*
Momentum	*2*	*(2)*	*7.7%*	*7.1%*	*7.0%*	*5.9%*	*−0.7%*	*−1.3%*	*−1.4%*	*−2.5%*
Smart Beta	28	(17)	10.7%	10.1%	9.4%	8.5%	0.3%	−0.5%	−0.8%	−1.7%
Multifactor	*11*	*(10)*	*9.4%*	*8.6%*	*8.4%*	*7.3%*	*0.6%*	*−0.1%*	*−0.3%*	*−1.4%*
Equal Weight	*6*	*(5)*	*11.6%*	*11.1%*	*10.8%*	*9.8%*	*−0.8%*	*−1.2%*	*−1.0%*	*−2.0%*
Low Vol/Min-Var	*6*	*(0)*	*11.4%*	*10.6%*	*9.6%*	*8.9%*	*1.1%*	*−0.5%*	*−0.6%*	*−1.3%*
Fundamental Index	*5*	*(2)*	*10.4%*	*9.8%*	*8.7%*	*7.9%*	*0.4%*	*−0.1%*	*−1.2%*	*−2.0%*

Source: Research Affiliates, LLC, using data from Morningstar Direct.

ENDNOTES

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[1]Sadly, Tad (Robert H.) Jeffrey, an author of the 1993 article, is no longer with us. However, Rob Arnott, also an author of the 1993 article, felt it would be useful to understand how taxable asset management has evolved in the intervening years.

[2]According to estimates of Steven M. Rosenthal, available at http://www.taxpolicycenter.org/taxvox/ only-about-one-quarter-corporate-stock-owned-taxable-shareholders, and The World Bank Group, available at https://data.worldbank.org/indicator/CM.MKT.LCAP.CD.

[3]Arnott, Berkin, and Ye [2000]; Shoven, Dickson, and Sialm [2000]; and Longmeier and Wotherspoon [2006] estimated the average tax expenses to be on the order of 1%–3% per annum, which is larger than 1.1%–1.3% in average mutual fund fees that we estimate here.

[4]Our analysis is most applicable to a U.S. taxpayer. Most of the fund types common in the European Union (and the United Kingdom), such as open-ended investment companies, Société d'investissement à capital variables, and Undertakings for Collective Investment in Transferable Securities–regulated funds, have tax-related consequences much more similar to

how ETFs are treated in the United States, which we discuss in later sections of the article. Tax consequences in other jurisdictions can vary significantly, and investors are advised to consult a tax expert familiar with their local jurisdiction.

[5]Wyatt Earp is the legendary sheriff of the American West, whose fast gun-slinging took the lives of many outlaws.

[6]On rare occasions, we might choose to sell a lot with a lower cost basis if we have large tax losses that we are looking to offset.

[7]A *wash sale* occurs when an investor sells or trades securities at a loss and, within 30 days after the sale, buys substantially identical securities, acquires substantially identical securities in a fully taxable trade, or acquires a contract or option to buy substantially identical securities. U.S. Internal Revenue Service (IRS) rules prohibit the deduction of losses related to wash sales.

[8]In other words, selling early garners a larger capital gain, whereas waiting for the payment of the dividend reduces the capital gain by approximately the magnitude of the dividend; either way, the tax will be the same.

[9]See: https://www.sec.gov/rules/final/33-7941.htm.

[10]Beyond the articles listed in the text, many other studies have examined which specific mutual fund characteristics are predictive of future fund returns. Chen et al. [2004] found that larger funds tend to have worse performance. Carhart [1997] and Cremers and Curtis [2015] found that expense ratios negatively forecast fund performance. Chevalier and Ellison [1999] found that younger managers earned higher alpha compared to older managers and that managers who attended schools with high SAT admission scores tended to outperform managers who graduated from schools with lower SAT admission scores—perhaps IQ matters. Chen, Jegadeesh, and Wermers [2000] found that growth managers are better at stock selection than managers of income-oriented funds. Kacperczyk, Sialm, and Zheng [2008] found that the gap between the fund's realized performance and the performance of the portfolio of fund-disclosed holdings is persistent. Simutin [2014] found that funds with larger cash balances tend to show superior performance. Cremers and Petajisto [2009] found that fund active share is correlated with fund future alpha. Similarly, Amihud and Goyenko [2013] found that funds with a lower R^2 of the regression of fund return on a set of factors show better future performance. Doshi, Elkamhi, and Simutin [2015] found that the sum of absolutes of the difference between the weight held by the fund and its value weight is predictive of fund performance. Cremers and Pareek [2016] found that among the high active share only those funds that have low turnover tend to outperform. High-turnover strategies (including those with high active share) generally underperform. Kacperczyk, Sialm, and Zheng [2005] found that funds with higher industry concentrations tend to show better performance. Cremers et al. [2016] found that managers in countries with more explicit indexing generally tend to perform better, which is consis-

tent with the hypothesis that indexing increases competition in the mutual fund arena. Lou [2010] found that predictable fund flows explain most of the fund persistence in performance. This is, of course, just the tip of the iceberg, hardly an exhaustive list of all findings on the predictability of fund performance. Importantly, none of the literature we examined asked whether the alpha found survives on an after-tax basis.

[11]Selecting funds that survived for the whole 25-year period introduces survivorship bias. We also examined the 25-year period without survivorship bias and the most recent 10-year period with and without survivorship bias.

[12]The tax bill is, in part, a function of portfolio performance and thus is related to the market's performance. Because the value of most funds rises in periods when the market rises, and falls in periods when the market falls, the tax bill is also time varying.

[13]These rates are applicable U.S. federal tax rates for 2018 and include the 3.8% Obamacare tax on capital gains and dividends. State tax rates are in addition and can be large. For example, California's top income tax rate is 13.3%, which rises to an effective rate of 14.1% after accounting for the phasing out of deductions. Thus, Californians face an effective top tax rate of 38% for long-term capital gains and dividends and 51% for short-term gains and dividends.

[14]Zero turnover is, of course, not possible; mergers and acquisitions activity will trigger tax consequences that the investor cannot control. Index funds tend to have 2%–3% turnover, even when not rebalancing to catch the latest hot trend in the markets. Yes, Virginia, passive funds are (a little) active, too.

[15]A simple rule of thumb is that, although trading costs rise linearly with turnover unless trading is specifically designed to reduce the tax liability, tax costs rise in approximately equal steps with each doubling. Roughly as much additional tax is triggered regardless of the move from 5% turnover to 10%, or from 10% to 20%, or from 20% to 40%, or from 40% to 80%. Above 80%, taxation can essentially do no further damage because the great majority of trading is likely to trigger short-term capital gains tax treatment.

[16]More information on the keyword method of categorization is included in our explanation of Exhibit 4 in the Appendix.

[17]The 25-year test of surviving funds has a severe problem with survivorship bias because less than 10% of all funds span the entire quarter century. The 10-year test of all funds is vulnerable to two critiques: The longer span has far more data; and the recent span has been unusually brutal to value relative to growth, so it may be an anomalous decade.

[18]Multiple studies have offered likely predictors of a higher tax burden: (1) Turnover was suggested by Jeffrey and Arnott [1993]; Arnott, Berkin, and Ye [2000]; Longmeier and Wotherspoon [2006]; and Arnott, Berkin, and Bouchey [2011], and (2) dividend yield was proposed by Jeffrey and

Arnott [1993]. Furthermore, Berkin and Ye [2003] showed that the ability of a tax-advantaged fund to generate tax alpha differs by market environment. More specifically, when markets are more turbulent, during bear markets and in times of low market-wide dividend yield, tax-advantaged funds can generate more tax alpha. Bergstresser and Poterba [2002] examined, among other things, correlates and predictors of the tax burden. In addition to the previously mentioned predictors, they found that (1) current return is strongly correlated with the tax burden; (2) older funds, funds with recent inflows, tax-managed funds, and passive funds all are associated with a lower tax burden; (3) unrealized capital gains predictably increase the future tax burden; and (4) a high past tax burden predicts a future higher tax burden.

[19]Index funds and ETFs have about a 45% share of the U.S. equity market (De Planta [2017]).

[20]Jeffrey and Arnott [1993] were the first to highlight that a tax-conscious approach to money management, such as harvesting capital losses and avoiding unnecessary turnover, can significantly improve after-tax return. Dickson and Shoven [1994] showed that deferring taxes is easier for an open-end fund than for a closed-end fund and also demonstrated that the additional turnover required to implement tax-loss harvesting is quite modest. Shoven, Dickson, and Sialm [2000] studied externalities from pooling investments across multiple investors. Specifically, they showed that redemption may force mutual fund managers to realize capital gains that trigger a tax liability for the incumbent investors. Conversely, they showed that inflows can dilute unrealized capital gains positions in a fund, and thus improve the incumbent investors' tax consequences. Arnott, Berkin, and Bouchey [2011] and Bouchey [2010] provided a broad overview of the tactics employed in the management of tax-sensitive accounts.

[21]An ETN structure may expose an investor to counterparty risk and does not produce a regular income distribution, a feature preferred by some investors.

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