Deactivating Active Share

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April 2015

We investigate Active Share, a measure meant to determine the level of active management in investment portfolios. Using the same sample as Cremers and Petajisto (2009) and Petajisto (2013) we test the hypothesis that Active Share predicts investment performance. We find that the empirical support for the measure is not very robust and the difference in outperformance between high and low Active Share funds is driven by the strong correlation between Active Share and benchmark type. Active Share correlates with benchmark returns, but does not predict actual fund returns; within individual benchmarks, Active Share is as likely to correlate positively with performance as it is to correlate negatively. Overall, our conclusions do not support an emphasis on Active Share as a tool for selecting managers or as an appropriate guideline for institutional portfolios.

We thank Michele Aghassi, Matt Chilewich, Joshua Dupont, Gabriel Feghali, Shaun Fitzgibbons, Jeremy Getson, Tarun Gupta, Anu Imani, Ronen Israel, Sarah Jiang, Albert Kim, Mike Mendelson, Toby Moskowitz, Lars Nielsen, Lasse Pedersen, Scott Richardson, Laura Serban, Rodney Sullivan, and Dan Villalon for their many insightful comments; and Jennifer Buck for design and layout.
Active Share is a metric proposed by Cremers and Petajisto (2009) and Petajisto (2013) to measure the distance between a given portfolio and its benchmark, and to identify where a manager lies in the passive-to-active spectrum. It ranges from zero, when the portfolio is identical to its benchmark, to one, when the portfolio holds only non-benchmark securities. Technically, Active Share is defined as one half of the sum of the absolute value of active weights:

$$\text{Active Share} = \frac{1}{2} \sum_{j=1}^{N} |w_j|$$

where $w_j = w_{j,\text{fund}} - w_{j,\text{benchmark}}$ is the active weight of stock $j$, defined as the difference between the weight of the stock in the portfolio and the weight of the stock in the benchmark index. Using holdings and performance data of actively managed domestic mutual funds (from the Thomson Reuters and CRSP databases, respectively), Cremers and Petajisto (2009) and Petajisto (2013) show that:

- Historically, high Active Share funds outperform their reported benchmarks.
- The benchmark-adjusted return of high Active Share funds is higher than the benchmark-adjusted return of low Active Share funds.

They also provide investors with a simple rule of thumb: funds with Active Share below 60% should be avoided as they are closet indexers that charge high fees for merely providing index-like returns.

Not surprisingly, these results have attracted considerable attention in the investment community. In response, more active mutual funds and institutional money managers tout their Active Share, several leading investment consultants strongly emphasize the measure, and online tools are now available to allow investors to screen managers based on Active Share. Institutional investors are more focused on asset managers with a high Active Share, and some have even embedded a high Active Share requirement in their investment guidelines. For example, a recent request for proposals from a large public pension plan includes the following requirement:

“The firm and/or portfolio manager must: (...) Have a high Active Share in the Small-Cap Strategy, preferably greater than 75% in the last three years”; furthermore “if the Active Share is lower than 75%, please clearly state that in the RFP response and explain why the Active Share is low and why it is beneficial.”

These observations suggest that Active Share is influencing capital allocation decisions among retail and institutional investors, with a potential large wealth impact. While investors may prefer or require managers to maintain a high Active Share for a variety of reasons, one plausible hypothesis is that some investment professionals have interpreted the findings above as evidence that investors have historically been better off by selecting managers with a higher Active Share. In particular, when selecting managers within a specific capitalization spectrum or benchmark (for example in the request for proposals above, a U.S. Small-Cap benchmark) the implicit assumption in requiring a high Active Share is that higher Active Share managers have a greater chance of outperforming that benchmark.

In this paper, we address the question of whether investors have been better off by selecting managers with a high Active Share. Using the

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1 For example: http://online.wsj.com/public/resources/documents/st_FUNDS20140117.html
same sample and methodology of Cremers and Petajisto (2009) and Petajisto (2013), we show that the relation between Active Share and mutual fund returns in excess of their benchmark is driven by the correlation between Active Share and benchmark. Controlling for differences in benchmark returns, there is no significant relation between Active Share and fund returns. We show that statistically, there is no difference in total return between high Active Share funds (“Stock Pickers”) and low Active Share funds (“Closet Indexers”). On the other hand, high Active Share funds have benchmarks that have significantly underperformed the benchmarks of low Active Share funds.

To be clear, our data and baseline results are the same as Cremers and Petajisto (2009) and Petajisto (2013), and our result that the difference in active returns between high and low Active Share funds is due to their benchmarks is clearly mentioned in Cremers and Petajisto (2009): “the standard non-benchmark-adjusted Carhart alphas show no significant relationship with Active Share. The reason behind this is that the benchmark indices of the highest Active Share funds have large negative Carhart alphas, while the benchmarks of the lowest Active Share funds have large positive alphas.”

In this paper we closely replicate the findings produced in Cremers and Petajisto (2009) and Petajisto (2013) but we believe that their conclusions are subject to misinterpretation. We have three main results:

- High Active Share funds tend to have small-cap benchmarks while low Active Share funds tend to have large-cap benchmarks. Sorting funds on Active Share is equivalent to a sort on benchmark type.
- There is no reliable statistical evidence that high and low Active Share funds have returns that are different from each other.
- For a given benchmark, there is no reliable statistical evidence that high Active Share funds outperform low Active Share funds.

Overall, our conclusions do not support an emphasis on Active Share as a tool for selecting managers or as an appropriate guideline for institutional portfolios.

Our results should not be too surprising. Active Share is a measure of active risk, and simply taking on more risk is unlikely to lead to outperformance just by itself. Moreover, if one argues that Active Share can predict performance, what about other measures of concentration? For example, tracking error captures similar dimensions as Active Share, and yet high-tracking-error funds do not outperform low-tracking-error funds (e.g., Cremers and Petajisto, 2009). Schlanger, Philips and Peterson LaBarge (2012) look at five different measures of active management and find no evidence that they predict performance.

Another illustration is Amihud and Goyenko (2013), who find that distance from an index (which they measure by regression $R^2$) does not

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2 Cremers and Petajisto (2009), page 3333. Moreover, Cremers, Petajisto and Zitzewitz (2013) discuss methodological choices that can lead to positive estimated alphas of large-cap benchmarks and large negative alphas of small-cap indices.

3 For example, “U.S. mutual funds with higher active share significantly outperformed those with lower active share” (Ely, 2014, p. 4); “empirically higher active share means higher returns” (Allianz, 2014, p. 7); “portfolios with high active share tend to outperform others” (Flaherty and Chiu, 2014, p. 1); etc. As we show below, these statements overstate the evidence in Cremers and Petajisto (2009).

4 Cremers and Petajisto (2009) and Petajisto (2013) suggest that Active Share captures stock selection while tracking error captures factor timing (e.g., section 1.3 of the former and pp. 74–77 of the latter paper). This is an interesting conjecture, but it does not help explain why one of these types of active management leads to outperformance but the other one does not.
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by itself correlate significantly with outperformance. However, managers who are more likely to be skilled (e.g., those with exceptional past performance) are more likely to outperform going forward when they take on more risk. Thus, just taking on risk is not a good measure of skill; however, it is possible that managers who do have skill may be able to earn higher returns by taking on more risk.

In general, if the universe of mutual fund managers holds the market portfolio, we know that the market clears: before fees, every dollar of outperformance must be offset by a dollar of underperformance. Low Active Share investors who simply track the market (“Closet Indexers”) should match market returns before fees and underperform after fees. As a result, investors who take larger bets (and have high Active Share) should also match market returns before fees and underperform after fees (Sharpe (1991)). Among the high Active Share investors, there will be winners and losers, but as a group they do not systematically outperform the Closet Indexers.

This is, of course, an approximation, since the aggregate portfolio of actively managed funds and the market portfolio are not identical. Differences between the two may lead the aggregate mutual fund sector to beat the market and make it possible that some group of funds systematically outperforms. However, the evidence on this point is mixed. Fama and French (2010) find that the aggregate portfolio of actively managed U.S. equity mutual funds underperforms gross of fees. Wermers (2000) finds evidence of aggregate outperformance, while Chen et al. (2000) find no evidence of either under- or outperformance.

Of course, our central message that Active Share is not a useful measure of skill does not mean that Active Share is not useful at all. For example, Active Share may be useful in evaluating fees. In general, fees should be commensurate with the active risk funds take: if you deliver index-like returns, you should charge index-fund-like fees. Active Share is one possible measure of the degree of “activity” in a portfolio; other measures include predicted and realized tracking error and other concentration measures. A prudent investor should use multiple measures to determine if a manager is taking risks commensurate with fees. 5

Active Share and Mutual Fund Benchmarks

Our sample is the same as in Petajisto (2013) and includes data on Active Share and benchmark assignment on all actively managed U.S. domestic mutual funds from 1980 to 2009. 6 We follow the methodology in Petajisto (2013) closely and focus on performance over the period from 1990 to 2009, but our conclusions also hold for the shorter sample of Cremers and Petajisto (2009).

Before evaluating manager performance, we look at the composition of the manager universe with regard to their Active Share.

Exhibit 1 plots the average, the 25th and 75th percentile of the funds’ Active Share within each benchmark in our sample. 7 Exhibit 1 shows that sorting managers based on their Active Share is equivalent to a sort on their benchmark type. Large-cap funds (clustered to the left) have lower

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5 The idea that some fees are too high is not new and is not limited to “closet” indexers. For example, Busse, Elton, and Gruber (2004) study 52 S&P 500 index funds (proper, not closet indexers). All funds in their sample deliver the same portfolio, but charge very different fees that range from 6bps to 135bps per year.

6 The data is available on Petajisto’s website: http://petajisto.net/data.html. We complement it with mutual fund returns from the CRSP Mutual Fund database, academic factor returns from Ken French’s website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html, and with benchmark index returns obtained from eVestments.

7 Data are over 1990-2009. Two of the 19 benchmarks used in Cremers and Petajisto (2009) and Petajisto (2013), Wilshire 4500 and Wilshire 5000, only have 2 and 5 funds, respectively, in the average month, so we excluded them from our analysis.
average Active Share while small-cap funds (clustered to the right) have higher average Active Share. The difference in Active Share between large and small-cap funds is substantial: the top quartile of Active Share of large-cap funds is below the bottom quartile of Active Share of small-cap funds. In other words, investors selecting high Active Share managers will tilt toward small- and mid-cap managers, and will avoid large-cap funds. In practice, few investors would evaluate all equity managers on a particular dimension and then accept whichever benchmark falls out of that selection. Instead, many investors are likely to start with a benchmark (for example, a small-cap benchmark as in our example in the introduction) and select managers within that benchmark. We will later follow this approach in our empirical analysis.

Exhibit 2 compares performance across benchmarks in our sample. We estimate four-factor alphas, controlling for each benchmark’s market beta and its exposures to size, value and momentum. Alphas are computed as the intercept in a time-series regression of benchmark returns over risk-free rate on market, size, value and momentum factors. Importantly, we do not use any actual fund returns for this analysis, only the returns of benchmark indices.

Exhibit 2 shows that over our sample period, small-cap indices (which tend to be the benchmark of high Active Share funds) underperform large-cap indices (which tend to be the benchmark of low Active Share funds). The differences are large, with annualized alphas ranging from -3.35% for Russell 2000 Growth to +1.44% for S&P 500 Growth. The fitted regression
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Exhibit 2 — Active Share Correlates With Benchmark Type and Benchmark Alphas. For each benchmark index we compute that benchmark's four-factor alpha (the intercept in the regression of benchmark returns over risk-free rate on market, size, value and momentum factors) and plot it against the average Active Share of all funds that follow that benchmark. Benchmarks are sorted on the average Active Share, as in Exhibit 1. The sample runs from 1990 to 2009.

line implies about 2% difference between the extremes, and the slope is significant at the 1% level with a t-statistic of 2.92. The results in Exhibit 2 are consistent with Cremers, Petajisto and Zitzewitz (2013), which also shows and discusses the underperformance of small-cap benchmarks over this sample period. They are also consistent with findings of other studies that have observed that Active Share’s performance predictability can be explained by a bias toward the small-cap sector.⁸

To summarize, looking at the universe of U.S. domestic fund between 1990 and 2009, high Active Share funds tend to have small-cap benchmarks while low Active Share funds tend to have large-cap benchmarks. Over the same period, small-cap indices have underperformed large-cap indices. Next we turn to the implications of these findings for the relation between Active Share and performance.

Active Share and Mutual Fund Performance: Benchmark Performance vs. Fund Performance

Following Petajisto (2013), we sort mutual funds into groups based on their Active Share and realized tracking error. The funds are then allocated into portfolios, for example, “Stock Pickers” or “Closet Indexers.” The “Stock Pickers” group is comprised of the managers who are in the highest quintile of Active Share intersected with all but the highest quintile of tracking error. The “Closet Indexers” are the lowest quintile of Active Share intersected with all but the highest quintile of tracking error. We rely on the same portfolio assignments as Petajisto (2013) so that our analysis that can be compared apples-to-apples with the original studies.

First, we confirm that the benchmark-selection bias above pervades these fund groupings based on Active Share and Tracking Error. In the “Closet Indexer” group of funds, over 91% of the sample (fund-month observations) comes from large-cap funds in the S&P 500 and Russell 1000 family of benchmarks. Across the “Stock Picker” funds, 56% of the sample is benchmarked to Russell 2000 index alone and 75% to small- and mid-cap benchmarks.

Table 1 replicates the main result of Petajisto (2013). The headline result is that Stock Pickers outperform both passive benchmarks and their Closet Indexer peers. It is not difficult to see why Active Share generates so much interest: Stock Pickers (portfolio P5) outperform Closet Indexers (portfolio P1) by over 2% per year, a figure that is statistically and economically significant.\(^9\) The result is compelling when comparing both benchmark-adjusted returns and four-factor alphas.

Many in the investment community have interpreted this result as evidence that mutual fund investors are better off selecting high Active Share managers. Note, however, that a key feature of the above analysis is the focus on benchmark-adjusted returns to study performance:

\[
R_{\text{fund}} - R_{\text{benchmark}}
\]

Specifically, the left column of Table 1 reports the average benchmark-adjusted returns to each Active Share grouping and the right column of Table 1 regresses benchmark-adjusted returns on academic factors to calculate alphas. Benchmark-adjusted returns surely are important — after all, managers are tasked with outperforming their benchmarks, and the above difference may capture skill better than funds’ raw returns. However, benchmark-adjusted returns should not be the only metric one looks at, particularly when comparing funds across various benchmarks. Doing so confounds differences between funds and differences between benchmark indices (recall the pattern from Exhibit 2). In other words, this measure may look attractive when the fund return, \(R_{\text{fund}}\), is high when compared with other funds, but also when the benchmark return, \(R_{\text{benchmark}}\), is low relative to other benchmarks.

To better understand the role the benchmarks play in the significance of the results, Table 2 decomposes the average returns and the alphas of

\(^9\) See Petajisto (2013), Table 5. We compute alphas using the entire sample period, 1990-2009. Our results are within 5bps/year of the performance of the most relevant portfolios, P1 ("Closet indexers") and P5 ("Stock Pickers"), as well as the difference between them. The small differences may be driven for example by CRSP revising historical mutual return data.
Table 2 — Active Share Predicts Benchmark Performance, but Not Fund Performance. We decompose annualized net-of-fee returns and alphas of the five Active Share portfolios in Table 1 into the contribution from fund return and alpha and the contribution from the benchmark return and alpha. We compute alphas as the intercept in the regression of benchmark-adjusted fund returns on market, size, value and momentum factors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

<table>
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<th>Dependent variable</th>
<th>Decomposing benchmark-adj returns:</th>
<th>Decomposing alphas:</th>
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<tr>
<td></td>
<td>Fund minus benchmark</td>
<td>Fund</td>
</tr>
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<td>Closet Indexers (P1)</td>
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<td>8.28**</td>
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<td></td>
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<td></td>
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<td>Factor bets (P3)</td>
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<tr>
<td></td>
<td>(-1.32)</td>
<td>(2.00)</td>
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<tr>
<td>Concentrated (P4)</td>
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<td></td>
<td>(-0.32)</td>
<td>(1.99)</td>
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<tr>
<td>Stock pickers (P5)</td>
<td>1.21*</td>
<td>10.99***</td>
</tr>
<tr>
<td></td>
<td>(1.81)</td>
<td>(2.89)</td>
</tr>
<tr>
<td>P5 minus P1</td>
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<td>2.71</td>
</tr>
<tr>
<td></td>
<td>(3.33)</td>
<td>(1.62)</td>
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</table>

Source: AQR. Please see “Category Descriptions” in the Disclosures for a description of the categories used.

To summarize, we are unable to find reliable statistical evidence that high Active Share funds have achieved higher returns or alphas than low Active Share funds. Benchmarks drive the difference in benchmark-adjusted performance between low and high Active Share funds.

Controlling for Benchmark, Active Share Does Not Predict Performance

As we saw in Exhibit 1, a rank on Active Share effectively ranks funds by their benchmark. We think it is more reasonable to rank funds separately within each benchmark. This way we are directly comparing high and low Active Share funds that share the same benchmark universe. With this methodology, we can recalculate returns and alphas for the five Active Share groupings. We do so in Table 3, using the same fund and return data as in Tables 1 and 2. For ease of reference, Table 3 re-states the original results from Table 1, side-by-side with our newly calculated returns where all comparisons are within benchmark.

Once we control for benchmarks, the performance difference between Stock Pickers and Closet Indexers (raw, benchmark-adjusted, or alphas), while positive, is not statistically different from zero. Benchmark-adjusted returns are nearly halved from 2.14% to 1.16% with statistical significance dropping from a t-statistic of 3.33 to 1.48. Benchmark-adjusted alphas drop from 2.42% to 0.88% with the t-statistic dropping.
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from 3.81 to an insignificant level of 1.48. This result is consistent with our earlier finding that the performance improvements associated with Active Share are driven by the correlation between Active Share and benchmark.

Exhibit 3 breaks out the difference in alpha between Stock Pickers and the Closet Indexer group benchmark-by-benchmark. The figure shows Stock Pickers earn higher returns than Closet Indexers in about half of benchmark indices (eight out of 17) and in only one is the relationship statistically significant (we denote significance with a red border). In each of the remaining nine benchmarks, higher Active Share predicts lower performance (in one benchmark, significantly so).

Table 3 — Active Share Performance Results. In the two leftmost columns we report net-of-fee annualized performance of the five mutual fund portfolios in Table 1. These portfolios are based on a sort on Active Share across the whole universe of funds. In the two rightmost columns, we present performance of analogous portfolios based on a sort on Active Share within each benchmark separately. We evaluate performance of these portfolios by computing their average benchmark-adjusted returns and alphas. We compute alphas as the intercept in the regression of benchmark-adjusted fund returns on market, size, value and momentum factors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Source: AQR. Please see “Category Descriptions” in the Disclosures for a description of the categories used.
The exhibit shows that the lack of robustness is not due to less popular or less utilized indices; on the contrary it is apparent also for the most popular and widely followed benchmarks. For example Stock Pickers earned (statistically insignificantly) higher returns than Closet Indexers within the S&P 500 index (the most popular benchmark in our sample with 356 funds on average), but earned (statistically insignificantly) lower returns than Closet Indexers within the Russell 1000 Growth (the second most popular benchmark used by about 123 funds on average).

To summarize, for a given benchmark, we are unable to find reliable evidence that high Active Share funds earn higher returns than low Active Share funds.

**Conclusion**

In this paper, we use the same sample as Cremers and Petajisto (2009) and Petajisto (2013) to re-evaluate the empirical evidence of Active Share’s return predictability. We show that high Active Share funds are predominantly funds benchmarked to small- and mid-cap indices and that these benchmarks did poorly over the 1990-2009 sample period. We find no significant statistical evidence that high and low Active Share funds have returns that are different from each other. We conclude that Active Share does not reliably predict performance, and that investors who rely on it to identify skilled managers may reach erroneous conclusions.

Active Share may not be useful for predicting outperformance, but it may well be useful for evaluating costs. Fees matter and we believe they should be in line with the active risk taken. Active Share is one measure to assess the degree of active management, but it is just one of many, and a prudent investor may choose to use it in conjunction with measures such as predicted (ex-ante) tracking error. To the extent that these measures capture different aspects of active management (as Cremers and Petajisto (2009) and Petajisto (2009) argue), using them in tandem could make it easier for investors to identify managers who might be overcharging for the active risk they deliver. Moreover, while Active Share may not capture all dimensions that tracking error accounts for, it is a relatively simpler measure to explain, which may be beneficial for some investors and portfolio overseers.
Related Studies


Biographies

**Andrea Frazzini, Ph.D., Principal**
Andrea is a senior member of AQR’s Global Stock Selection team, focusing on research and portfolio management of the Firm’s Long/Short and Long-Only equity strategies. He has published in top academic journals and won several awards for his research, including Bernstein Fabozzi/Jacobs Levy Award, the Amundi Smith Breeden Award, the Fama-DFA award, the BGI best paper award and the PanAgora Crowell Memorial Prize. Prior to AQR, Andrea was an associate professor of finance at the University of Chicago's Graduate School of Business and a Research Associate at the National Bureau of Economic Research. He also served as a consultant for DKR Capital Partners and JPMorgan Securities. He earned a B.S. in economics from the University of Rome III, an M.S. in economics from the London School of Economics and a Ph.D. in economics from Yale University.

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Jacques is the head of AQR’s Global Stock Selection team and is involved in all aspects of research, portfolio management and strategy development for the firm’s equity products and strategies. Prior to AQR, he developed quantitative stock-selection strategies for the Asset Management division of Goldman, Sachs & Co. Jacques earned a B.S. in applied mathematics from Brown University and an M.S. in applied mathematics from the University of Washington. Before joining Goldman, he was pursuing a Ph.D. in applied mathematics at Washington, where his research interests ranged from mathematical physics to quantitative methods for sports handicapping.

**Lukasz Pomorski, Ph.D., Vice President**
Lukasz is a senior strategist in AQR’s Global Stocks Selection group, where he conducts research on equity markets and engages clients on equity-related issues. Prior to AQR, he was an Assistant Director for Research in the Funds Management and Banking Department of the Bank of Canada and an Assistant Professor of Finance at the University of Toronto. His research has been published in top academic journals and won several awards, including the first prize award at 2010 Chicago Quantitative Alliance Academic Paper Competition, 2011 Toronto CFA Society and Hillsdale Canadian Investment Research Award, and the 2013 Best Paper Award from the Review of Asset Pricing Studies. Lukasz earned a B.A. and M.A. in economics at the Warsaw School of Economics, an M.A. in finance at Tilburg University, and a Ph.D. in finance at the University of Chicago.
Disclosures

Category Descriptions

We follow the process described in details in Petajisto (2013). We focus on all actively managed domestic equity mutual funds over the period 1990–2009. We use the data on funds’ Active Share and tracking error that we downloaded from Petajisto’s website, http://www.petajisto.net/data.html . Petajisto (2013) and Cremers and Petajisto (2009) computed active share (tracking error) from mutual fund holdings reported in the Thomson Reuters database (from daily mutual fund returns, primarily from the CRSP mutual fund database).

To construct the portfolios, we sort funds first on active share and then on tracking error, into quintiles of these two variables. We follow C&G in our Tables 1 and 2 and sort funds across the whole universe, regardless of benchmark. In our Table 3 we sort funds separately within each benchmark.

The allocation to portfolios is as described in Table 3 of Petajisto (2013). Closet Indexers (P1) are funds in the bottom quintile of Active Share and the four bottom quintiles of tracking error; Moderately Active (P2) are funds in quintiles 2–4 of Active Share and quintiles 1–4 of tracking error; Factor Bets (P3) are funds in quintiles 1–4 of Active Share and the top quintile of tracking error; Concentrated (P4) are funds in the top quintile of Active Share and top quintile of tracking error; Stock Pickers (P5) are funds in the top quintile of Active Share and quintiles 1–4 of tracking error.

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