Is it worth getting active? A study on active share and fund performance in Sweden

Erik Eidvall & Jonathan Enqvist

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Abstract

The occurrence of closet index funds has been widely debated in Sweden in recent years. This study examines whether a higher level of mutual fund activity, measured by the two fund activity measures active share and tracking error, correlates with higher fund returns. Using a sample of 75 Swedish all equity mutual funds and three major benchmark indices, both Large and Small/Mid Cap, over the ten-year period of 2007-2016, we perform panel data regressions controlling for year fixed effects. We include two supplementary variables in the regressions as well; market capitalization and fund age. The results show that tracking error is significantly correlated with active share. We find that active share has a small and positive correlation with fund return, while tracking error has no significant effect on return. Regarding the level of activity we find that Swedish mutual funds are becoming more truly actively managed, and the degree of closet indexing is decreasing. The average level of active share has increased from 50.46% to 60.61% over the time period, while the proportion of truly active funds has increased from 28.89% to 50.72%.

Keywords: Mutual fund, closet indexing, active share, tracking error, active fund management

Contents

1 Introduction

1.1 Background

In recent years, the Swedish fund market has experienced an increase in total number of mutual funds and new, more complex funds have been introduced to the market. More capital is also being transferred to the fund market; in 2016 the net transfer to the Swedish fund market was SEK 53.2 billion (Swedish Investment Fund Association, 2017). Following this, the demand for new evaluation tools has increased among the investors. The investors want to know whether the fund is investing in line with its explicit investment strategy, as presented in the fund prospectus, or not. A fund that is marketed as an actively managed fund normally charge higher management fees than explicit index funds, but there is no obligation for the active fund to deviate from any benchmark indices. This is a case known as closet indexing; that a fund, marketed as and charging fees as a truly active fund, achieves similar return as the benchmark index, without replicating the index exactly. Closet indexing has been a hot topic on the news in Sweden in recent years (Svenska Dagbladet, 2015b).

The Swedish Shareholders' Association, Aktiespararna, has on several occasions over the last few years been trying to take legal action against Swedbank Robur Funds. Aktiespararna considered two of the funds, which were marketed as active funds, to actually be closet index funds (Aktiespararna, 2015). Although they have not been successful in the courtroom (ARN, 2015), the lawsuit gained a lot of media and government attention (Svenska Dagbladet, 2015a).

In March 2015, the Swedish government launched an investigation, specifically targeting the issue of closet indexing. The purpose of the investigation was to propose actions that would elucidate the difference between actively and passively managed funds (see Dir. 2015:28). A commission report was presented in June 2016 and proposes following; For a mutual fund that not is an index fund, the fund issuer should present measures of activity in the annual report. If activity cannot be measured, the issuer should in other ways describe how the fund is managed (Lindeblad, 2016). The aim of this proposition is to improve transparency in the mutual fund market and to provide investors with better information. The proposition is expected to be brought up for vote in the parliament in 2018.

Closet indexing is still an important issue for Aktiespararna. In an interview in with the Swedish daily paper Svenska Dagbladet in February 2017, the newly appointed Head of market surveillance says that one of the most important tasks for Aktiespararna is to work for more transparency regarding how active the actively managed funds really are.

1.2 This study

The aim of this study is to examine whether Swedish mutual funds with higher level of active management experience higher fund return. This will be done by examining the level of active share and tracking error among Swedish all equity mutual funds during 2007-2016, and compare it with three widely used benchmark indices. Our hypothesis is that there will be a positive correlation between our activity measures (active share and tracking error) and fund return and that the proportion of closet index funds (actively managed funds with an active share below 60%) will be high.

We will also take a glance at how the level of active share has changed over time and how extensive the case of closet indexing is in Sweden; that is, how many of the actively managed funds that really can be considered active.

This study is inspired by Cremers and Petajisto (2009), who introduced the concept of active share. In short, active share can be explained as the difference between a fund's portfolio stock weightings and the weightings of an assigned benchmark index. Cremers and Petajisto set a threshold of an active share of 60% for a fund to be called a truly active fund. An active share of less than 60% thus implies that the fund is a closet index fund. This is the same threshold as we will use. Actively managed funds with an active share of at least 60% will be referred to as (truly) active funds and actively managed funds with active share less than 60% will be referred to as passively managed active funds, passive funds or closet index funds.

There is not too much research on active share internationally, and even less research on the level of active share in Sweden. Though Cremers et al. (2016) investigate the level of active share in multiple countries and found that at that time, the average country has 22% closet index funds while Sweden had 56% closet index funds.

In contrary to many other studies we include both broad and more narrow indices, an index that follow the UCITS V-framework (the EU regulation for mutual funds, henceforth UCITS) weighting regulation and one that does not. We also include a number of funds that do not follow the UCITS-framework, so called AIF-funds (Alternative Investment Funds, known as Specialfonder in Swedish legislation). The reason for this is that it is fairly easy for private investors to buy and sell AIF-funds in Sweden and we want to give a broad and fair picture of the level of fund activity in the Swedish fund market in this paper. Our tests showed that comparing the funds with OMXS30 rather than SIXPRX resulted in a lower active share for a majority of the Large Cap funds.

For our research we have collected quarterly data on holdings and return of 75 all equity Swedish funds, stretching from Q1 2007 to Q4 2016 and data on the weightings and return of three major Swedish indices. We have also collected monthly

returns of the funds and indices, for the purpose of calculating tracking error on a quarterly basis in order to have the same time intervals for all our variables. We supplemented this data with the funds' market capitalization and age at each quarter.

We found that the average level of active share among all funds has increased from 50.46% in March 2007 to 60.61% in December 2016. Even more interesting is that the proportion of truly active funds has increased from 28.89% in March 2007 to 50.72% in December 2016. The interpretation of this is that in December 2016, more than half of all funds marketed as active all equity Swedish funds, were truly active in terms of active share measurements.

While the reason behind the increase in average active share in recent years remain unclear, it is clear that several major Swedish banks have launched low cost explicit index funds in recent years (Morningstar, 2012). Fierce competition from these types of funds is often present in countries with high levels of active share (Cremers et al., 2016).

By running regressions of fund return on active share, tracking error and the supplementary variables market capitalization and fund age, with year fixed effects, we can conclude that active share has a significant small, and positive, relationship with fund return. Tracking error did, however, not have a statistically significant correlation with fund return. The coefficient of active share (in the specification including all our variables) was 0.0276 and significant at the 1% level. This could be interpreted as that a 1% increase in active share corresponds to a 0.0276% increase in fund return.

Our results were in line with the study conducted by Cremers and Petajisto (2009), which used U.S. data. They concluded that active share predicts fund performance.

2 Previous literature

2.1 Active share

The concept of active share was introduced by Cremers and Petajisto (2009) as a new way of measuring active management and the level of closet indexing, in addition to tracking error. Active share is a measure that focuses on the holdings of the fund and the index, rather than the returns. The authors describe it as a measure that ''can be easily interpreted as the fraction of the portfolio that is different from the benchmark index''. For instance, an explicit index fund has an active share close to zero.

The two main advantages of measuring active share, as presented by the authors are; it provides information about a mutual fund's ability to outperform its

benchmark index, because in order to beat the index, the fund's holdings need to deviate from the benchmark index.

Second, active share can be used both on its own and together with tracking error, which gives a more holistic view on active fund management as well as a more nuanced view on the level of alpha in different portfolios.

Another contribution was their matrix (see Figure 1 below) (Cremers and Petajisto, 2009) where they divided all funds into five categories depending on the level active share and tracking error, reflecting the fund's investment strategy.

Figure 1. Different types of active and passive management.
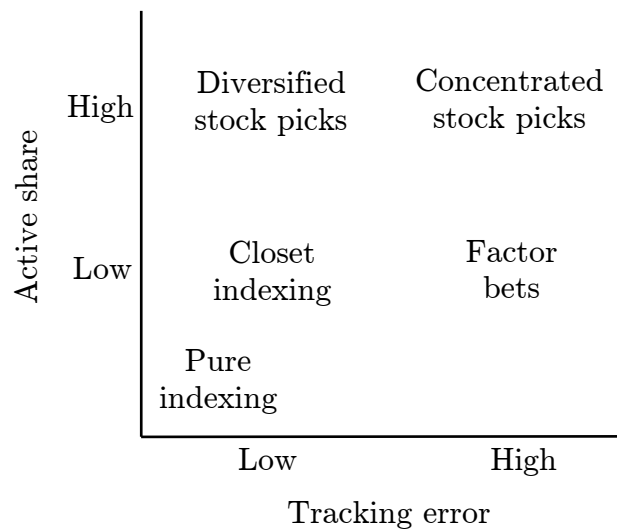
Note: This figure is retrieved from Cremers and Petajisto (2009) and shows how they categorise funds depending on different levels of active share and tracking error.

Petajisto (2013) focuses on the dynamics between active share and tracking error, but also general research regarding the level of active share and tracking error among some major U.S. mutual funds. Using the fund categories (in Figure 1) developed by Cremers and Petajisto (2009) he examines whether funds from different fund categories perform differently and if any form of active management is superior to the other. His major findings was that only funds with the characteristics of ''diversified stock picking'' (high active share, low tracking error) yields a positive benchmark adjusted net return. He also finds that Small Cap funds generally have a higher level of active share and that active share is more strongly correlated to future return among Small Cap funds.

The level of active share in different countries was investigated by Cremers et al. (2016). They find that actively managed mutual funds have a higher level of active management as well as lower management fees when there is more competition from

explicit index funds with low fees. Another finding is that the average alpha generated by active management is higher in countries with lower levels of closet indexing and more explicit index funds.

The average country in their data set has 22% explicit index funds, 20% closet index funds (a level of active share of less than 60%) and 58% truly active funds (by country of domicile and as percentage of total net assets (TNA)). The corresponding levels in Sweden are 10% explicit index funds, 56% closet index funds and 34% truly active funds. Corresponding levels by country of sale (instead of domicile) for the entire data set is are 18% explicit index funds, 22% closet index funds and 60% truly active funds and corresponding levels in Sweden are 11% explicit index funds, 27% closet index funds and 64% truly active funds.

Before the concept of active share was introduced, Kacperczyk et al. (2005) conducted similar research where they looked into whether mutual equity funds' industry concentration affected the return. A high level of industry concentration means lower level of diversification, which will increase the idiosyncratic risk and expected return. Cremers and Ankur (2016) compare this measurement with active share.

Kacperczyk et al. (2005) find that funds that are more concentrated deliver higher risk-adjusted return than less concentrated funds, and they can prove this relationship statistically. The abnormal return of the concentrated mutual funds can be derived from higher stock selection ability.

The conclusion of Kacperczyk et al. (2005) is that funds that outperform their benchmark index (net of fees) often have substantially different holdings, which is in line with the many papers by Martijn Cremers regarding active share.

Cremers and Ankur (2016) further investigates differences between different mutual funds with high level of active share. Their major finding is that among funds that trade frequently, there is no significant difference between high and low active share funds, and both types underperform. However, when comparing funds that trade infrequently, they find that low active share funds generally underperform, but high active share funds outperform their benchmark index by 2% on average. This implies that even though active share is an important measure, one should not exclude other fund characteristics since they could have explanatory value.

2.1.1 Criticism of active share

Recently there has been some arguments against the concept of active share, e.g. by Frazzini et al. (2016). In their study they use the same data as Cremers and Petajisto (2009) and replicate their results, but come to a different conclusion. Their main findings were that funds with high active share generally have Small Cap benchmark indices and funds with low active share tend to have Large Cap benchmark indices.

Hence sorting on active share is equivalent to sorting on the type of benchmark index.

They found no statistical evidence that the return of funds with high active share differ from funds with low active share. In addition, they could not conclude that funds with high active share could outperform funds with low active share, for a given benchmark index,

Petajisto (2015) has responded to this critique, where he argued that Frazzini et al. (2016) had excluded large and vital parts of the original research papers, and this is why they came to a different conclusion. In detail, they summarised results by benchmark index, which led to popular indices such as S&P500 being given the same weight as less popular indices, e.g. narrow Small Cap indices. This was one of the main reasons for why they came to a different conclusion.

2.2 The Swedish fund market

Flam and Vestman (2014) describe the characteristics of the Swedish mutual fund market. They find that although Sweden is among the top countries in the world regarding equity fund penetration, the investors may have little knowledge about the fund issuer and the fund holdings. Investing in funds is seen as an easy way of getting exposure to the stock market.

Their major finding was that the average actively managed fund in their dataset had a negative net alpha, but a positive gross alpha, during the period of 1999-2013. This implies that the fund manager adds value to some extent, but this value is smaller than the management fee, which means that the net effect for the investor is negative.

3 Data

3.1 Choice of sample

For our sample we have chosen to investigate only the funds that have been marketed as actively managed all equity Swedish funds by the issuer. The sample includes both funds that follow UCITS-framework and other funds, i.e. funds that are labeled as AIF-funds (Alternative Investment Funds). Funds that are explicit index funds have been excluded from the sample. In order for us to designate suitable benchmark indices for the funds, we categorise the funds as either Large Cap or Small/Mid Cap, depending on the benchmark index assigned by Morningstar.

The benchmark indices used in this paper consist of two indices with Large Cap focus, Six Portfolio Return Index (SIXPRX) and OMX Stockholm 30 (OMXS30), and the Carnegie Small Cap Return Index Sweden (CSRXSE), which focuses on Small

and Mid Cap companies. The SIXPRX is a broad index that is weighted in line with the UCITS-framework and reinvests dividends. The UCITS-framework stipulates that a fund cannot invest more than 10% of the fund's total assets in a single company, and that companies with a weighting of 5% or more cannot make up more than a total of 40% together (DIR. 2014/91/EU).

SIXPRX is an All Cap index with weightings skewed towards the Large Cap companies due to market capitalization. SIXPRX consists of more than 250 stocks traded on OMX Stockholm, and the composition of SIXPRX is revised every six months and the weightings are based on market capitalization. CSRXSE is a broad index that reinvests dividends and consisted of 241 stocks in December 2016. The OMXS30 is narrower and consists of the 30 most traded stocks on NASDAQ OMX Stockholm. The composition of OMXS30 is revised every six months and the weightings are based on market capitalization.

We have chosen our time horizon to be a ten-year period with quarterly data from Q1 2007 to Q4 2016, for a maximum total of 40 data points for each fund and index. The selection of funds in the sample is based on whether the funds had sufficient data on holdings or not. In other words, our sample does not include funds that only have return data available.

3.2 Databases

General information about the funds, their strategic objectives and area of focus has been retrieved from Morningstar and from the issuers' fund prospectus. Information about the founding dates of the funds is retrieved from Morningstar, Bloomberg and fund prospectus.

In order to retrieve fund holdings we used the Holdings database, provided by Modular Finance AB. Holdings gathers its data from Euroclear, Morningstar and Finansinspektionen (Sweden's financial supervisory authority). From the Holdings database we also retrieved data on the funds' market capitalization for each quarter. Since it is not public on what basis Holdings selects the funds to include in their database, there could be a potential problem of selection bias.

Fund return data is retrieved from the Bloomberg Terminal and is reported net of fees, even in the cases when the return is not NAV-based (net asset value).

The index weightings and the index returns for the three indices are retrieved from the SIX Trust database, provided by SIX Financial Information Sweden.

Since funds have changed names and stocks have changed tickers over time, we had to adjust for these changes. Fund name changes are gathered from Morningstar, while information about stock ticker changes was provided by Netfonds Bank AS.

3.3 Overview of the sample

Our final data set consists of a total of 75 funds. It contains funds that have complete data over the whole time horizon as well as funds that only have holdings or return data over a part of the period. See an overview of the number of funds and the respective number of periods in Table 1 and Table 2 below. This means that our data is not fully balanced. Funds that had less than one year of data are excluded. The data for all of the three indices were complete in terms of both weightings and return throughout the entire time period. The fund return and index return data was gathered both on a monthly and on a quarterly basis. The reason for gathering monthly returns as well is that we will use the monthly return differences to calculate the tracking error on a quarterly basis.

Through Holdings we retrieved the funds' holdings in Swedish equity. Although funds normally have some proportion of cash, and could in some cases have non-Swedish equity holdings, these are considered small enough not to have an effect on our results. We have excluded funds that state, in their prospectus, that they are able to invest more than 10% of the fund's TNA in non-Swedish equity.

As mentioned in section 3.1, we chose to include both funds that follow the UCITS-framework and those that do not (AIF-funds). Those who do not follow the UCITS-framework could invest relatively more in each position (since UCITS sets limits on how large each holding can be in a fund portfolio). This means that AIF-funds can achieve a relatively high level of active share in ways that are not possible for the UCITS regulated funds, which could have implications for our results. This is also something that could be problematic when comparing them to indices weighted in line with the UCITS-framework.

We chose to treat all share classes of a particular stock as one asset and use only the market value of all of the shares to determine the weighting, which is in line with the method used by Cremers and Petajisto (2009).

Table 1. Overview of the fund holdings data.

| | | Periods with holdings data | | | |
		4-20	20-39	40	Total
Number of funds	Large Cap	9	12	29	50
	Small/Mid Cap	3	12	10	25
	Total	12	24	39	75

Note: The table shows the number of funds that has holdings data in 4-20, 20-39 or 40 periods. One period is equal to one quarter of a year, and there are a total of 40 quarters over ten years.

Table 2. Overview of the fund return data.

		Periods with return data			
		4-20	20-39	40	Total
Number of funds	Large Cap	11	10	29	50
	Small/Mid Cap	11	6	8	25
	Total	22	16	37	75

Note: The table shows the number of funds that has return data in 4-20, 20-39 or 40 periods. One period is equal to one quarter of a year, and there are a total of 40 quarters over ten years.

4 Methodology

4.1 Tools for analysing the active management

The two different measures that we will use to analyse the level of activity are active share and tracking error. Tracking error is the oldest measure of fund activity and it focuses on the differences in returns of the fund and its benchmark index. It is a widely used way for an investor to see at what extent the volatility of the fund is the same as the volatility of the fund's benchmark index. However, in recent years a new measure of fund activity, i.e. active share, has been more widely used. Active share focuses on the holdings of the fund and its benchmark index, rather than the differences in fund return. Active share adds a new dimension to the evaluation of a fund's level of activity (Cremers and Petajisto 2009).

4.1.1 Active share

In this paper we use the original definition of active share, as proposed by Cremers and Petajisto (2009), and define it as:

$$\text{Active share} = \frac{1}{2}\sum_{i=1}^{N}\left|w_{fund,i} - w_{index,i}\right|$$

where $w_{fund,i}$ is the portfolio weight of the asset i in the fund, and $w_{index,i}$ is the portfolio weight of the asset i in the index. The formula includes a division by two to adjust for the fact that active share should be 100%, rather than 200%, if the fund does not have any stocks that are included in the index.

Active share effectively measures how much the fund overlaps with the index in terms of stock holdings. The formula makes sure that we only count the actual overlap with the index. If there is a case where the fund has either a stock overweight

or underweight compared to the index, only the overlapping part will decrease the active share. If the fund's weighting of a particular stock is larger than the index weighting, the active share will not decrease more than if the weightings would have been equal. If a stock is included in both the fund and the index, then the lower the fund's weighting of the stock, the higher is the fund's active share.

In line with Cremers and Petajisto (2009), we set the cut off point for a fund to be labeled truly active to 60%, i.e. its active share needs to be at least 60% in order to be labeled truly active. Their arguments for this is that about 50% of the index value will have a return below the index average, and the stocks that just beat the index normally are to unattractive to include in a fund, net of fees. Therefore, they argue that the fund manager should choose his index positions from the top 40% of the index holdings. If the fund manager includes more than that it is most likely in order to reduce possible downside, rather than to beat the index. Our arguments for choosing the 60% cut off point is in line with one of the papers mentioned above. Arguments for a cut off point of 50% have been brought forward in recent years, e.g. Petajisto (2013). If we were to apply a 50% cut off point, the proportion of active funds would increase which can be seen in appendix A3. Although the regressions in 5.2 and 5.3 would be unaffected by a new cut off point since they are run with actual level of active share without considering the cut off point.

4.1.2 Tracking error

Ex-post tracking error is the actual tracking error and is measured in hindsight, in contrary to ex-ante tracking error. We will henceforth refer to ex-post tracking error whenever we speak of tracking error in this paper. Tracking error is the time-series standard deviation of the difference between fund return and index return, defined as:

$$\text{Tracking error} = Stdev\left(r_{fund,t} - r_{index,t}\right)$$

where $r_{fund,t}$ is the fund return and $r_{index,t}$ is the index return. Our definition of tracking error is a common way of defining the measure and has been used for several decades (see Grinold and Kahn 1999). Low tracking error means that the fund is closely following its benchmark index in terms of return, and high tracking error means the opposite. Tracking error shows how volatile the fund portfolio return is relative to its benchmark index.

In this paper, we have chosen to calculate the tracking error over each quarter of the time horizon, using monthly returns of the funds and indices. The reason for this is that we want both of the measures (active share and tracking error) to have the same time interval between the data points.

4.1.3 Dynamics of the tools

An important shortcoming of the active share measure is the fact that it does not take into account shorting of stocks and derivatives that replicate stock return. If a fund has a derivative e.g., a call option based on, and with the same payoff as a stock that is in the benchmark index, then the fund will have a higher active share than a fund that holds the actual stock, even though both yield the same return. Although the majority of the funds in our data set are not able to short sell stocks since shorting is prohibited by the UCITS-framework (although synthetic shorting would be possible). We have also excluded AIF-funds that use shorting as part of their investment strategy.

There are also other ways to artificially increase active share, e.g. using an inappropriate benchmark index that is too broad or too constituent-heavy.

The way we have chosen to define active share, which is the same way as the originators, is approved by the Swedish Investment Fund Association (2015). This in turn is endorsed by the Swedish Government (Lindeblad, 2016), though they consider that cash positions should be included. That is something we have not included because of lack of available data. Funds' cash positions are generally small but some funds may, however, have slightly larger cash positions because of liquidity reasons.

The dynamics of active share and tracking error is well explained by Petajisto (2013). Consider a well diversified portfolio of 50 stocks, with holdings similar to its benchmark index. Further consider that all of the fund overweight (fund portfolio positions deviating from index) is in technology stocks, which tend to move together. Then the portfolio will have a low active share, but a high tracking error.

Consider another portfolio active in a market where there are 50 industries and 20 companies in each industry. A fund manager that picks one stock from each industry, with the same industry weights as the benchmark index, will most likely end up with a high active share, but a low tracking error since most of the active risk will be diversified away.

The conclusion of this is that active share can be used as a proxy for stock selection and tracking error can be used as a proxy for systematic factor risk and together the two measures provide a more complete picture of active management than any of the measures on its own.

4.2 Other variables - market cap and fund age

We choose to include two complementary variables in our analysis; market capitalization and fund age. These variables may add some explanatory value in our regressions. Fund age is measured in number of months since the founding date of the

fund. Market capitalization is the value of the fund portfolio, measured in millions of SEK.

4.3 Empirical strategy

We will start our empirical investigation by examining how our activity measures, active share and tracking error, have changed over time among our sample of Swedish mutual funds. Descriptive statistics of all variables are presented in appendix A1.

Our main aim of this study is to investigate whether the return of Swedish funds increases with higher levels of activity. This will be done by first examining whether tracking error, market cap and fund age affects the level of active share. Since we have panel data with quarterly data points over a period of ten years, we find it relevant to perform regressions with year fixed effects. It is reasonable to believe that funds might experience similar kinds of macro trends across the years, e.g. the financial crisis in 2008.

Our first regression will be performed using a regression of active share on tracking error, market cap, fund age and year dummy variables:

$$Active\ share_{it} = \beta_0 + \beta_1 Tracking\ error_{it} + \beta_2 Market\ cap_{it} + \beta_3 Fund\ age_{it}$$
$$+ \sum_{n=2008}^{2016} \delta_n year_{nt} + \varepsilon_{it}$$

The regression model consist of a total nine dummy variables to take into account the different effects of all ten years from 2007-2016.

After evaluating the determinants of active share, we will move on to investigate whether a higher level of activity increases the return of the funds. This regression will be conducted with fund return, active share, tracking error, market cap, fund age, and year dummy variables:

$$Fund\ return_{it} = \beta_0 + \beta_1 Active\ share_{it} + \beta_2 Tracking\ error_{it} + \beta_3 Market\ cap_{it}$$
$$+ \beta_4 Fund\ age_{it} + \sum_{n=2008}^{2016} \delta_n year_{nt} + \varepsilon_{it}$$

This regression also includes nine year dummy variables, in order to control for the common trends of each year.

When assigning a suitable benchmark index for each fund, we compare the Small/Mid Cap funds with the CSRXSE. For the Large Cap funds, we choose the index, either OMXS30 or SIXPRX, that leads to the lowest average active share over the whole time period. We only compare one index for each fund for the whole

period. This is in line with the method used by Cremers and Petajisto (2009). We found that comparing the fund holding to the narrow OMXS30, rather than broad SIXPRX, generated a lower active share for the majority of the Large Cap funds, which can be seen in Table 3 below.

Table 3. Overview of the funds' assigned indices.

|	Indices		
	CSRXSE	OMXS30	SIXPRX
Number of funds	25	38	12

Note: The table shows how many of the funds are assigned to each benchmark index.

5 Results

5.1 The level of activity among Swedish mutual funds

Looking at how the average active share of the funds in our dataset has changed from 2007-2016, we can conclude that there has been a steady increase over the ten year sample period. The total average level of active share of all funds has increased from 50.46% in March 2007 to 60.61% in December 2016. The average level of active share has been significantly higher among Small/Mid Cap funds than Large Cap funds and the total average is skewed towards the Large Cap funds since they make out a larger share of the data set. See Figure 2 for an overview of how the average active share has changed over the time period.

Figure 2. Average active share over the time period.
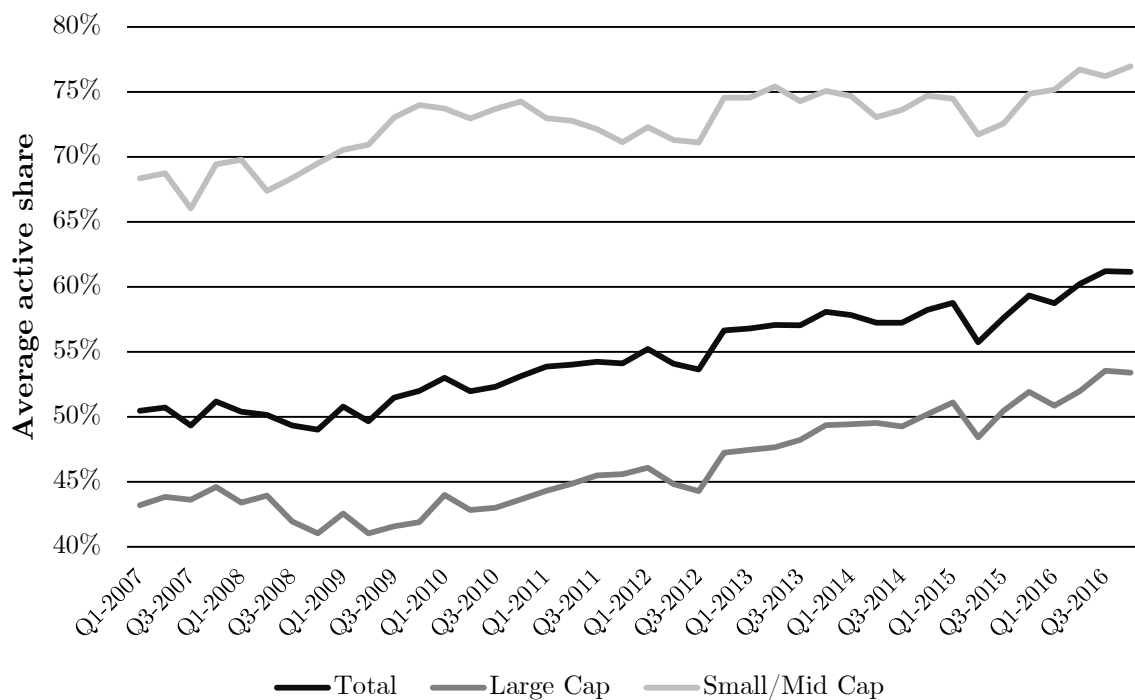
Note: The graph shows the quarterly average active share for all funds from 2007-2016. N.b. that fund size is not taken into account, i.e. all funds have the same weight when calculating average active share.

The active share among both Large Cap and Small/Mid Cap funds has increased in recent years, but the increase in active share regarding Large Cap funds has been more noticeable in relative terms. In the aftermath of the financial crisis in 2008, the level of active share decreased more in relative terms among Large Cap funds. See Figure 3 for the normalised changes in average active share.

**Figure 3.** Normalised change in average active share over time.
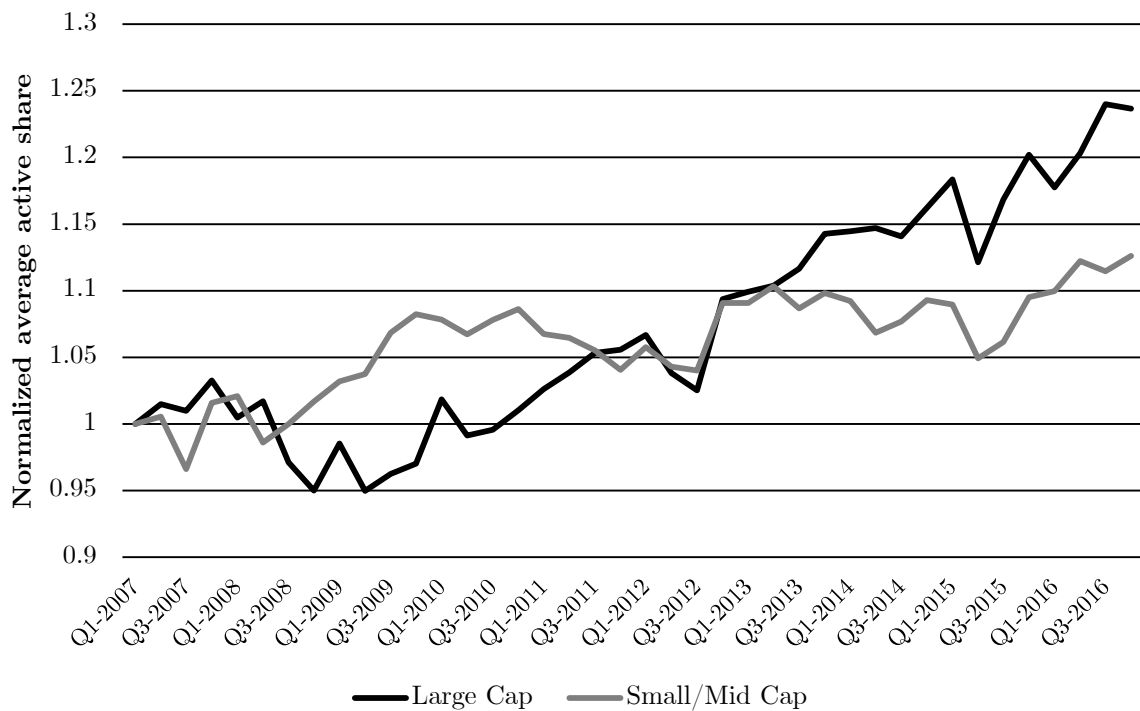
Note: The graph shows the normalised change in average active share from Q1 2007 to Q4 2016, for Large Cap and Small/Mid Cap funds respectively.

The pattern regarding the proportion of funds that are considered active (funds that have an active share of at least 60%) has been similar to the pattern regarding average active share. The proportion of funds that have an active share above 60% has increased from 28.89% in Q1 2007 to 50.72% in Q4 2016, as seen in Figure 4.

When comparing the proportion of active funds with regards to Large Cap funds and Small/Mid Cap funds it becomes obvious that Small Cap funds generally are more active than Large Cap Funds (see figure 5). In Q4 2016, only 1 out of 22 Small/Mid Cap funds had an active share below 60%, whilst 33 out of 47 Large Cap funds had an active share below 60%. Since the number of Small Cap funds is substantially smaller (see Appendix A2 for further details) than Large Cap funds, each individual fund have a bigger effect on the results when analysing the data within each category.

As seen in appendix A2, total number of passive funds has been rather stable during the majority of the time period, while the number of truly active funds has increased rapidly.

Figure 4. Proportion of truly active funds over time.
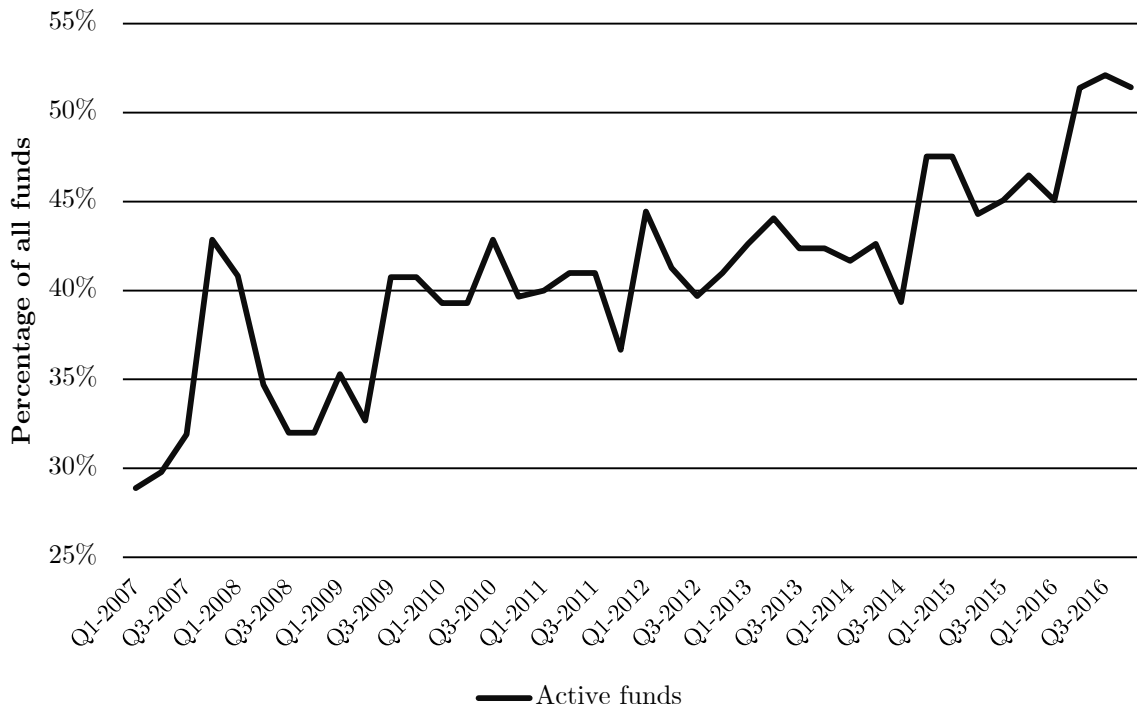
Note: The graph shows the proportion of all funds with an active share of at least 60%. As can be seen the proportion of truly active funds has increased since 2007.

Figure 5. Proportion of truly active funds split into the two categories.
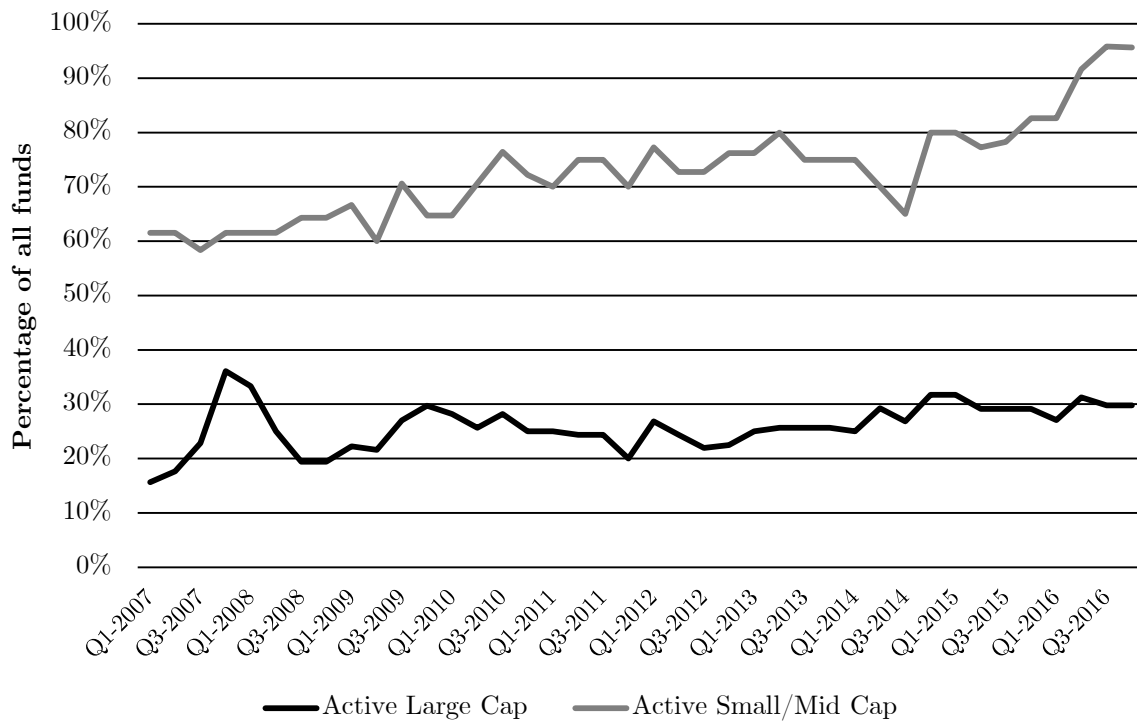
Note: The graph shows the proportion of funds with an active share of at least 60%, divided into Large and Small/Mid Cap. As can be seen the proportion of truly active Small Cap funds has constantly been higher than the proportion of truly active Large Cap funds. However, both proportions are higher in 2016 compared to 2007.

The dynamics of active share and tracking error are visualised by the two-dimensional table, Table 4. By examining the table it is possible to draw a conclusion of a positive correlation, which will be further investigated by with the regression in section 5.2. Although one can spot some dispersion within most categories of both active share and tracking error. For example, a tracking error of 1-1.5% can be associated with all levels of active share.

Table 4. Annual average active share and annualised tracking error.

		Annualised tracking error (%)							
		<0.5	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	>3.5	All
	90-100			7	6	7	4	3	9	36
	80-90			5	9	7	3		6	30
Annual	70-80		2	9	21	12	5	4	1	54
average	60-70	1	4	14	22	20	10	4	6	81
active	50-60	1	9	27	34	11	5	3	1	91
share	40-50		12	35	23	7	1		1	79
(%)	30-40	1	11	28	7	5	2		2	56
	20-30	4	17	26	15	3	6	2	2	75
	10-20	5	8	6	2	2	2			25
	0-10			1						1
	All	12	63	158	139	74	38	16	28	528

Note: The table shows each fund's annual average active share and annualised tracking error for every year. Consequently, there are a total of 528 in this table (instead of 75, which is the number of funds in the sample). The annualised tracking error is calculated by using monthly return data, and the annual average active share is retrieved by calculating the mean of the four quarters' value of active share.

While the average level of active share has increased over the years, the same cannot be concluded about tracking error. Our data shows that the average level of tracking error has decreased slightly, both for Large Cap funds and Small/Mid Cap funds. See Figure 6.

Figure 6. The change in average tracking error over time.
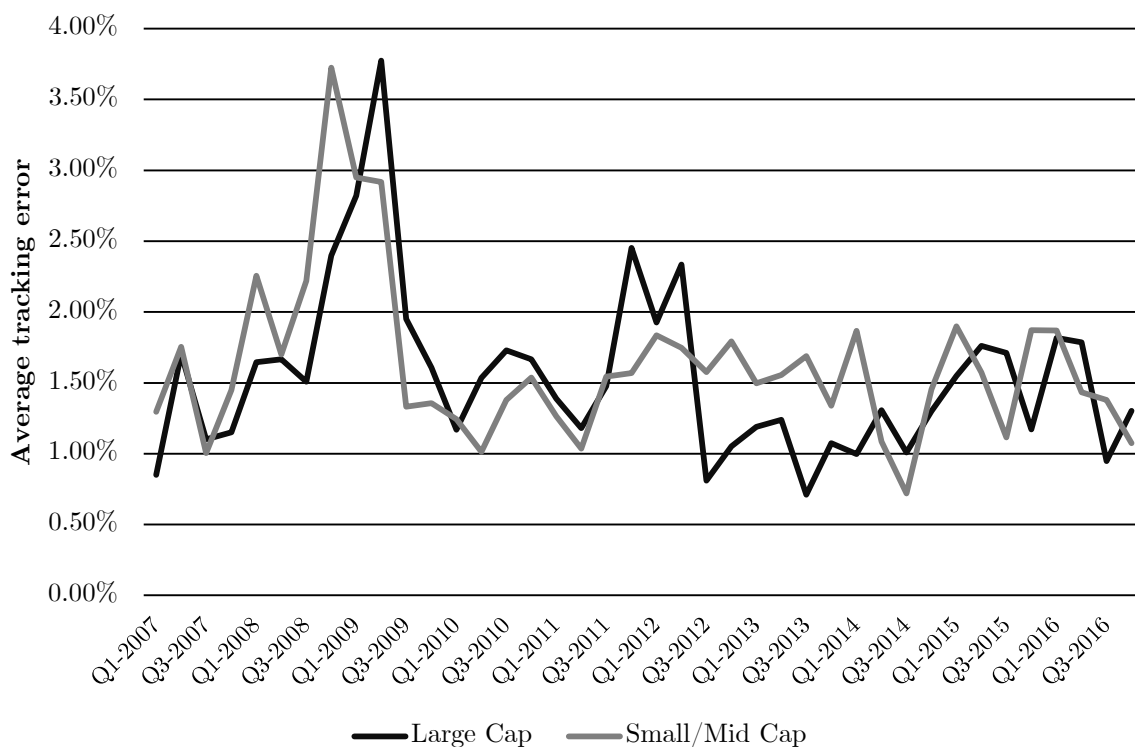
Note: The graph shows the quarterly average tracking error from 2007-2016 for all funds. N.b. that fund size is not taken into account, i.e. all funds have the same weight when calculating average tracking error.

5.2 Determinants of active share

When running regressions on active share, we can conclude that tracking error has a large and significant effect on active share in every specification (see Table 5 below). Both market cap and fund age have small, negative coefficients that both are significant on the 1% level. In Table 5, we can also see that R-squared increases when we add market cap and fund age into the regression. The fact that the level of active share decreases with the age of the fund is in line with the results of Cremers and Petajisto (2009).

Table 5. Regressions of active share.

| | Active share | | | |
	(1)	(2)	(3)	(4)
Tracking error	6.415***	5.833***	4.793***	4.638***
	(0.454)	(0.444)	(0.413)	(0.412)
Market cap		-1.25e-05***		-7.35e-06***
		(8.80e-07)		(9.78e-07)
Fund age			-0.00125***	-0.00109***
			(5.42e-05)	(5.95e-05)
Constant	0.428***	0.476***	0.618***	0.623***
	(0.00826)	(0.00913)	(0.0121)	(0.0119)
Year dummies	Yes	Yes	Yes	Yes
Observations	2,049	2,049	2,022	2,022
R-squared	0.133	0.200	0.299	0.320

Note: Regression of active share on tracking error, market cap, fund age, and year dummy variables. The different specifications (1) to (4) include different combinations of variables. Significance levels are marked according to: *** $p <$ 0.01, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses. As we see in specification (4), a 1% increase in tracking error corresponds to a 4.638% increase in active share.

5.3 The effect of active share and tracking error on return

Are active share and tracking error good measures for predicting fund return? In our regressions (see Table 6), the results are clear that active share has a significant effect on the fund's return. The coefficient is small and R-squared is around 38%. Tracking error is not significant in any of the specifications, but as we saw in the last section, tracking error has a significant effect on active share itself. Adding the complementary variables market cap and fund age does not seem to improve the model, as R-squared just slightly improves. Market cap is significant at the 5 % level, but the coefficient is very small.

Table 6. Regressions of fund return.

| | Fund return | | | | |
	(1)	(2)	(3)	(4)	(5)
Active share	0.0253***		0.0242***	0.0297***	0.0276***
	(0.00809)		(0.00882)	(0.00912)	(0.00979)
Tracking error		0.151	0.0703	0.0765	0.0867
		(0.195)	(0.216)	(0.215)	(0.216)
Market cap				8.90e-07**	9.13e-07**
				(3.52e-07)	(3.68e-07)
Fund age					-1.10e-05
					(2.73e-05)
Constant	0.0110**	0.0231**	0.0105**	0.00465	0.00686
	(0.00449)	(0.00317)	(0.00465)	(0.00529)	(0.00747)
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	2,026	2,130	2,026	2,026	2,001
R-squared	0.382	0.374	0.382	0.383	0.386

Note: Regression of fund return on active share, tracking error, market cap, fund age, and year dummy variables. The different specifications (1) to (5) include different combinations of the variables. Significance levels are marked according to: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust standard errors in parentheses. As we see in specification (5), a 1% increase in active share corresponds to a 0.0276% increase in fund return.

As seen in section 5.2 that tracking error was positively correlated with active share. When regressing fund return on only tracking error (specification 2), the coefficient is not significant. By adding active share into the model (specification 3), the coefficient is still not significant for tracking error, but significant on the 1% level for active share. We can therefore conclude that, using our sample, tracking error is not a good measure for predicting fund return. Our results suggest that active share is a better measure.

6 Conclusion

6.1 Conclusion and implications of our study

Our hypothesis was that a higher level of fund activity would result in higher return of the fund. As seen in the results, the hypothesis stands true only for one of our two activity measures. There is a small positive correlation between fund return and active share significant at the 1%-level. Tracking error, on the other hand, has no

significant relationship with fund return. Although Table 2 shows that active share and tracking error are positively correlated. We can therefore conclude that, using our data, active share might be a better indicator of fund activity than tracking error, when analysing the effect on returns.

The average level of active share in Sweden is still today quite low, especially among Large Cap funds. The implication of this is that investors that buy closet index funds often pay a premium for active management but only receive close to index return. The fact that a fund is a closet index fund does not need to be negative per se, since index funds often yield decent risk-adjusted return. Although one could problematise around the information asymmetry, where investors pay for active management that they do not receive.

The high level of closet index funds could be thwarted in different ways. The Swedish Government has launched a proposition that will be up for vote in the parliament in 2018 forcing the fund issuers to show how active their funds really are, i.e. dealing with the problem of information asymmetry. (Lindeblad, 2016)

Cremers et al. (2016) proposes that the market itself can mitigate the existence of closet index funds, especially a high presence of low cost explicit index funds seem to increase the activeness in the market.

In 2012, two major Swedish banks launched their own explicit index funds, free from management fees; this could potentially be one explanatory factor why the level of active share has increased in recent years (Morningstar, 2012).

The relative high level of active share among Small/Mid Cap funds could partly be explained by the presence of e.g. Micro Cap funds and funds only investing in companies from specific Swedish counties in our data set. These funds naturally deviate from major indices in terms of holdings and weightings. In addition, since there are not too many Small/Mid Cap funds in the data set, these funds have a noticeable effect on the results.

The proportion of passively managed active funds is still today quite high in Sweden, even when the news coverage about closet indexing has been noticeable and the government has launched an investigation targeting closet indexing in particular. An explanation for this could be incomplete learning, a concept well explained in a financial context by Choi et al (forthcoming). This means that investors are more prone to invest new capital in good and well-performing funds than they are to withdraw their capital from poor-performing funds. This is interesting seeing that the number of inactive funds in our data has been fairly consistent over the years, but there has been a significant increase in truly active funds. Berk and van Binsbergen (2015) argue that the market recongnises well performing funds which leads to capital inflows into good performing funds.

6.2 Future research

The reason why the level of active share has increased in Sweden in recent years remains unclear. Whether it is because of media attention, government pressure, new competition from low fee index funds or something else would be interesting to investigate further.

As the mutual fund market develops and becomes more complex, the concept of active share could use of development for a more nuanced view. Cremers (forthcoming) is a good example of development of active share. In his paper he presents a new way of measuring active share which focuses more overlapping holdings and accounts for short positions. It would be interesting to look further into this measure and use this when calculating the active share on the Swedish fund market.

Another interesting potential extension of his thesis would be to examine the relationship between active share and risk adjusted return, as well as gross return. When comparing to risk adjusted return it is possible to see whether active share correlates with the alpha of the fund. When comparing with gross return you ignore the management fees and focus on the return generated by the fund manager, this would be a way of looking at this from the fund managers' point of view, rather than the investors'.

Another interesting topic for future research would be loss aversion, i.e. the tendency to prefer avoiding losses to equivalent wins, in the context of active share. Kostovetsky and Warner (2015) find that fund manager risk being fired or getting their fund closed in an event of poor performance, and they find statistical evidence that poor performance stretching back five years is a determinant of manager replacements. Further Ibert et al. (2017) explains the lack of aligned incentives between fund issuers and fund managers, where they only find a weak relationship between fund performance and manager pay. If a fund manager is not paid much for excess return, but risk being laid off when performing poorly, what are the incentives to deviate from the benchmark index then?

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8 Appendix

A1. Summary statistics of the variables.

|	N	Mean	Median	Std dev	Min	Max
Fund return	2,130	0.0254	0.0360	0.0966	-0.289	0.386
Active share	2,327	0.546	0.539	0.220	0.0545	1
Tracking error	2,130	0.0154	0.0129	0.0114	0.000532	0.102
Market cap	2,327	2,902	1,217	4,444	0.0365	34,022
Fund age	2,224	128.9	124	75.76	0	359

Note: The table shows descriptive statistics of all variables included in the regressions in Table 5 and Table 6. Market cap is shown in millions of SEK and fund age is shown in months.

<p style="text-align:center">A2. Number of truly active and passive funds in each time period.</p>

Period	Total		Large Cap		Small/Mid Cap	
	Active	Passive	Active	Passive	Active	Passive
Q1-2007	13	32	5	27	8	5
Q2-2007	14	33	6	28	8	5
Q3-2007	15	32	8	27	7	5
Q4-2007	21	28	13	23	8	5
Q1-2008	20	29	12	24	8	5
Q2-2008	17	32	9	27	8	5
Q3-2008	16	34	7	29	9	5
Q4-2008	16	34	7	29	9	5
Q1-2009	18	33	8	28	10	5
Q2-2009	17	35	8	29	9	6
Q3-2009	22	32	10	27	12	5
Q4-2009	22	32	11	26	11	6
Q1-2010	22	34	11	28	11	6
Q2-2010	22	34	10	29	12	5
Q3-2010	24	32	11	28	13	4
Q4-2010	23	35	10	30	13	5
Q1-2011	24	36	10	30	14	6
Q2-2011	25	36	10	31	15	5
Q3-2011	25	36	10	31	15	5
Q4-2011	22	38	8	32	14	6
Q1-2012	28	35	11	30	17	5
Q2-2012	26	37	10	31	16	6
Q3-2012	25	38	9	32	16	6
Q4-2012	25	36	9	31	16	5
Q1-2013	26	35	10	30	16	5
Q2-2013	26	33	10	29	16	4
Q3-2013	25	34	10	29	15	5
Q4-2013	25	34	10	29	15	5
Q1-2014	25	35	10	30	15	5
Q2-2014	26	35	12	29	14	6
Q3-2014	24	37	11	30	13	7
Q4-2014	29	32	13	28	16	4
Q1-2015	29	32	13	28	16	4
Q2-2015	31	39	14	34	17	5
Q3-2015	32	39	14	34	18	5
Q4-2015	33	38	14	34	19	4
Q1-2016	32	39	13	35	19	4
Q2-2016	36	35	15	33	21	2
Q3-2016	36	34	14	33	22	1
Q4-2016	35	34	14	33	21	1

Note: The table shows the total number of funds with an active share above (active) and below (passive) the threshold of 60%. The number of funds are divided into the two fund categories, Large Cap and Small/Mid Cap, and the total is shown on the left side of the table.

A3. Sensitivity analysis of cut off point.
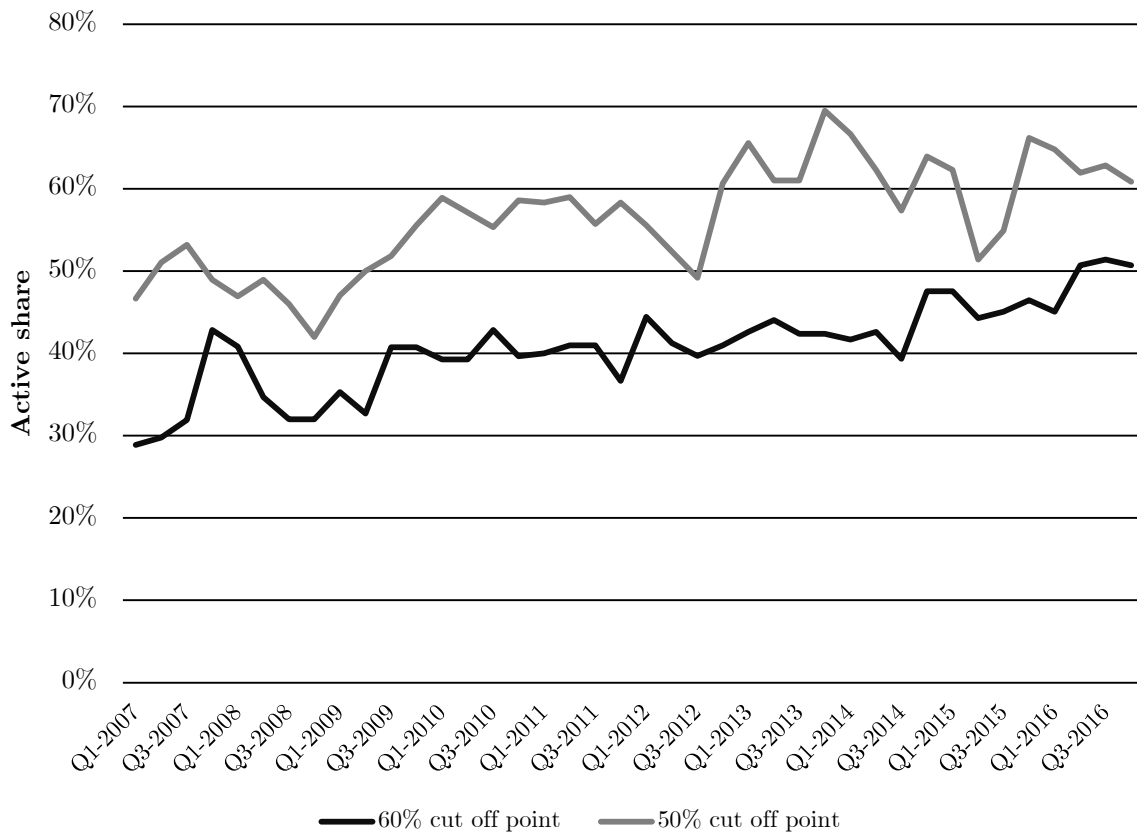
Note: The graph shows the proportion of funds that are considered truly active in each time period. The lower line shows the proportion when the cut off point is set to 60% active share, and the upper line shows the proportion when the cut off point is set to 50%.