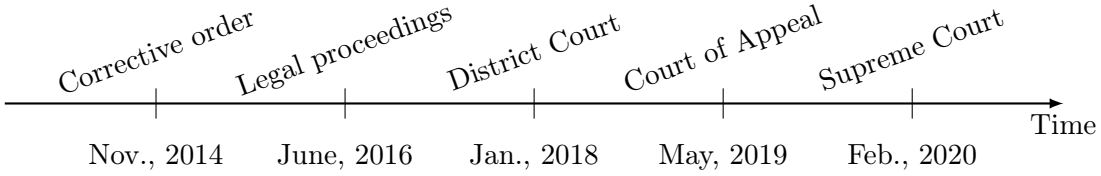
Online appendix to:

"Forced to be active: Evidence from a regulation intervention"

Petter Bjerksund
Trond Døskeland
André Wattø Sjuve
Andreas Ørpetveit

OA.1 Description of the DNB Norge case



- **Corrective order from FSA:** All Scandinavian financial authorities worked on the issue of closet indexing. The three countries cooperated and exchanged ideas between them. All countries carried out their own analyses identifying many closet index funds, but the Norwegian authorities gave the most severe consequences by issuing a corrective order (Financial Supervisory Authority of Norway, 2015). The Norwegian FSA gave two funds the alternative of increasing activity or lowering fees. We are unaware of the reasons behind these alternatives, but the goal was to address the immediate "problem" with closet indexing. We have not found any proof that the financial authorities considered the issue of increasing activity without having the necessary skill.

- **The Norwegian Consumer Council instituted legal proceedings:** On June 21, 2016, the Norwegian Consumer Council instituted legal proceedings before the Oslo District Court against DNB Asset Management AS (henceforth DNB), a wholly-owned subsidiary of DNB ASA providing asset management services (Norwegian Consumer Council, 2015). The Norwegian Consumer Council instituted a class-action to seek compensation on behalf of 180,000 investors in DNB Norge, a fund managed by DNB. The lawsuit alleged that investor information and high fees charged gave investors reason to expect active management. On the contrary, the funds were, in fact, managed very close to the index.

- **Oslo District Court judgment:** Oslo District Court passed its judgment on January 12, 2018, by which the claim was rejected and DNB was not liable. The verdict in Norwegian: Lovdata TOSLO-2016-105341-2.

- **Appeal to Borgarting Court of Appeal:** On February 12, 2018, the Norwegian Consumer Council appealed the judgment to the Borgarting Court of Appeal. The Court of Appeal ruling was announced on May 8, 2019, and ruled in favor of the Norwegian Consumer Council in the group action.

  In short, the Court of Appeal describes the effort of active management as (i) performing analyses to identify potential good bets; and (ii) translating this into active positions such that the fund deviates from the index to a not insignificant extent. By comparing investor information and the high fee on the one hand and the fact that the funds were managed very close to the index, the Court concluded that DNB had violated its obligations to investors. DNB was sentenced to

pay approximately NOK 350 mill (approx. USD 35 mill). The verdict in Norwegian: Lovdata LB-2018-43087.

- **Appeal to Norwegian Supreme Court:** DNB appealed the case to the Norwegian Supreme Court. The appeal case started on January 21, 2020. The ruling was delivered on February 27, upholding the Court of Appeal's ruling. This was a verdict that generated a lot of attention, see for example Better Finance press release (2020). The verdict (in English): Lovdata HR-2020-475-A.

OA.2 Details on data and sample

OA.2.1 Sample selection and raw fund data

In this section, we provide details on the sample and fund data.

Sample selection

The initial sample is compiled using Morningstar Direct. As discussed in the main section and illustrated in Table 1, the treated countries consist of Denmark, Norway, and Sweden, where the financial authorities have applied the most stringent scrutiny. In contrast, the initial sample of European countries consists of those where we have not identified any scrutiny by the Financial Supervisory Authorities (FSAs): Austria, Belgium, Finland, Poland, Portugal, and Switzerland.

For each of these countries, we compile lists of funds. Initially, we exclude non-equity funds and funds that do not invest in the location of the firms' management. Given that many funds offer multiple share classes, we retain the main share class within each fund, identified as the oldest. In addition, we narrow our sample to funds whose base currency aligns with that of their domicile. The specifics of the initial sample and subsequent restrictions are listed in Table OA.1.

Table OA.1. Sample selection of domestic equity mutual funds
This table presents the results of our sample selection process. Initially, we consider funds where the management company operates within the same geographic area as their investments. In the fund type screening (fund type), we exclude any funds registered as index funds, enhanced index funds, or fund of funds. To ensure meaningful analysis, we keep funds remaining operational one year before and after the event. Thus, funds with inception dates after January 31, 2013, or with obsolete statuses before December 31, 2016 are excluded during the step of assessing fund viability during the event. Lastly, we drop funds with missing data on variables such as returns, size and activity throughout the event period (data coverage).

Step	Total	Treated	Control
Initial	804	346	458
Fund type	621	295	326
Viability	322	155	167
Data coverage	303	150	153
Total sample	**303**	**150**	**153**
Active share $\leq 50\%$	133	75	58
Active share $\leq 40\%$	88	42	46

We then apply additional filters based on the type of fund. Given the focus of this study on interpreting the portfolios of actively managed funds, we require the funds to be actively managed. This means that they must manage a portfolio with the objective of outperforming a passive benchmark index and maintaining a managed portfolio. Consequently, we exclude funds classified as index funds, enhanced index funds, or fund of funds.

Furthermore, we impose the requirement that the selected funds possess sufficient data both before

and after the event window (January 2014 to December 2015). To ensure the robustness of our analysis, we require that each fund must have data beginning, at the latest, one year prior to the event and concluding, at the earliest, one year after the event. Thus, any fund launched after January 2013 or liquidated before December 2016 is excluded from the sample. Lastly, we exclude funds that lack sufficient data on variables like returns, size, and activity.

Fund data

Following sample construction, we collect fund data, including returns, gross returns, aggregated fund size across share classes, and portfolio holdings. In the case of returns, all income and capital gains are reinvested monthly. Returns are denominated in local currencies, while assets under management are standardized to USD to facilitate consistent cross-country comparisons. The "monthly return" figure encompasses various costs, such as trading costs and management fees, which are deducted from the Net Asset Value (NAV). In contrast, "gross returns" represent returns before management fees are applied. Consequently, we use these two variables to calculate expense ratios in accordance with Morningstar's definition.

OA.2.2 Benchmark data

A benchmark index must be assigned to measure active share and facilitate comparisons between fund and benchmark returns. In our sample, the funds concentrate exclusively on domestic investments. Therefore, their benchmarks are usually their country's primary stock market index. The extent of these benchmarks is largely aligned with the benchmarks assigned to them by Morningstar and Lipper. In situations where a fund does not have a designated benchmark, we select the most widely used domestic benchmark corresponding to the specific fund type within that particular country.

To compile constituent lists, benchmark weights, and benchmark returns, we rely on Datastream and Morningstar as our primary sources. If benchmark weights are unavailable, we employ value-weighted weights based on market capitalization for the index constituents. In instances where both constituent lists and benchmark weights are absent from both providers, we turn to the portfolio holdings of exchange-traded funds (ETFs) that physically replicate the same benchmarks.

OA.2.3 Sample

Table OA.2 provides summary statistics that include all active domestic European funds within the sample. This table represents the sample of funds from which we construct treatment groups in our primary analyses, primarily relying on active share levels.

Table OA.2. Summary statistics for equity mutual funds pre-event

This table presents summary statistics for the full sample of actively managed domestic equity mutual funds in Europe. Values are means over a two-year window before the event start. Expense ratios are annualized. Displayed values for competition are country-means for the Scandinavian countries and the rest of Europe, respectively. Inference on differences between treatment and control funds is based on heteroskedasticity and autocorrelation-robust standard errors. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

Sample	Full sample	Treated	Control	Difference
Number of funds	303	150	153	
Active share (%)	51.1	51.6	50.5	1.1
Gross alpha (%)	0.05	0.05	0.06	−0.01
Expense ratio (%)	1.33	1.35	1.31	0.04
AUM (million USD)	273	341	154	187**
Fund age (years)	12.7	13.3	12.0	1.3
Industry competition (1 - HHI)	0.85	0.86	0.83	0.03

OA.2.4 Variables

Table OA.3. Variable descriptions

This table documents our variables and their definitions.

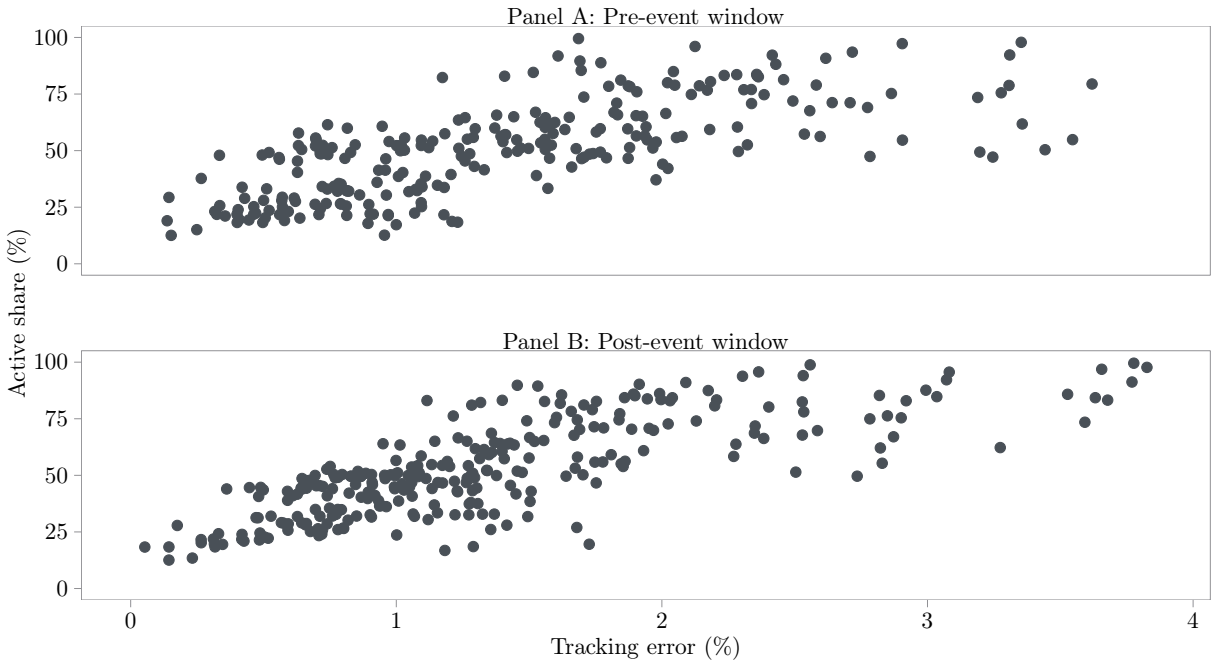
Name	Definition
Active share	Percentage of a fund's portfolio holdings that differ from its benchmark index holdings.
Expense ratio	Monthly expense ratio.
Gross alpha	Difference between the fund gross return and its benchmark return.
Net alpha	Difference between the fund net return and its benchmark return.
Factor-adjusted alpha	Three-factor alpha (percentage per month) with country-specific factors.
AUM	Total assets under management in USDm for all share classes.
Fund age	Number of years since the fund's launch date.
Industry competition	1 − Herfindah-Hirschman index (HHI). HHI is the fund family-level industry concentration in the country and defined as $\text{HHI} = \sum_{i=1}^{N} (w_i)^2$, where w_i is the AUM-based weight of fund family i in the country.

OA.2.5 Relationship between active share and tracking error

Active share and tracking error are commonly used in tandem to assess whether funds exhibit characteristics of closet indexing. The tracking error is the standard deviation of the funds' active returns. While active share provides a forward-looking perspective, tracking error necessitates historical data for its computation.

Figure OA.1 illustrates the average active share against tracking error using monthly return data in both the pre- and post-event windows, as presented in panel A and B, respectively. The robust relationship between these measures is evident with correlation coefficients of 0.71 in the pre-event window and 0.77 in the post-event window. This emphasizes the strong link between these metrics for domestic funds in our sample, reaffirming the findings of ESMA (2020).

Figure OA.1. Tracking error and active share
This figure illustrates the association between tracking error and active share within the fund sample. Panel A depicts this relationship for the pre-event window, while panel B represents it for the post-event window.

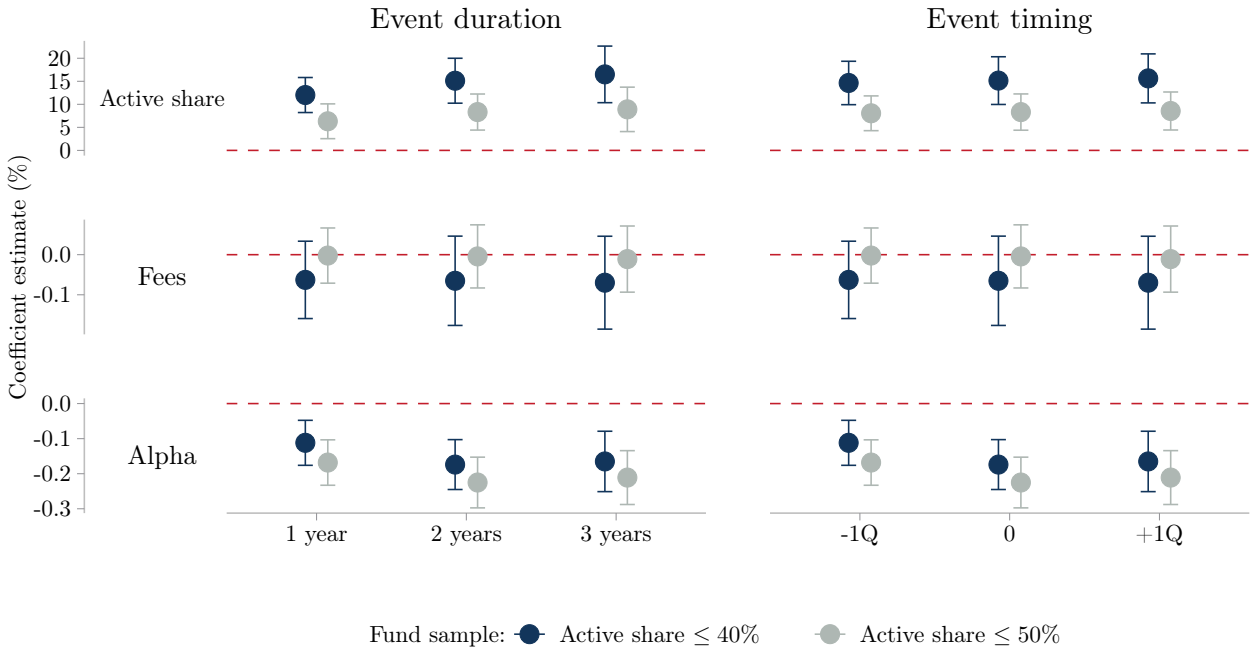


OA.3 Event window

In this section, we check the robustness of our main results when considering both the duration of our event and its timing.

Figure OA.2 shows robustness tests for active share, fund fees, and alpha using different durations of the event window and different start dates. The findings demonstrate consistent significance for active share and alpha, while fees remain consistently insignificant. Shifting the event start date by one quarter in both directions from our baseline of January 2014 does not materially alter our results.

Figure OA.2. Event window - duration and timing
This figure presents point estimates and their 95% confidence intervals for the difference-in-differences (DiD) analyses on the impact of policy scrutiny for **active share**, **fees**, and **alpha**. We vary the event's duration (±1 year from our two-year baseline) and timing (±1Q from our baseline start in January 2014), illustrating the robustness of our findings detailed in Tables 3, 4, and 5.



OA.4 Fund net flows

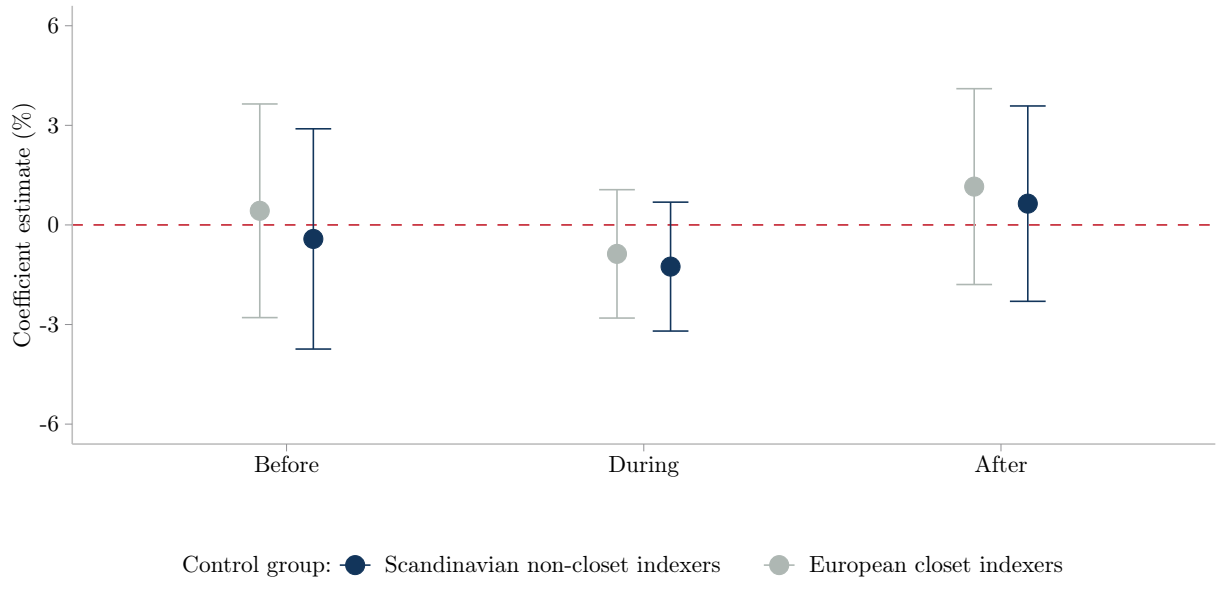
In this section, we provide details on the demand side of how investors responded to the event.

OA.4.1 DNB Norge

The most publicly scrutinized fund is arguably the Norwegian fund DNB Norge. When searching all Norwegian news outlets for the keyword "DNB Norge" during the period between January 2013 and December 2019, 807 results are returned, many of them referring to the lawsuit. However, when combining "DNB Norge" and "Skapindeks" (closet indexer) for the same period, only nine hits were found. Thus, few articles referred to the fund explicitly as a closet indexer, with only one originating from a non-financial source. Despite the high-profile nature of the DNB Norge case, investors had limited exposure to it as a closet index fund through media coverage. Furthermore, after the NCC lawsuit, only eight out of 180,000 customers reached out to express their grievances.[1]

In Figure OA.3, we observe no significant differences in average net flow between DNB Norge and various control groups before, during, and after the event period. Thus, it appears that even the most clearly labeled closet index fund did not experience a significant shift in capital allocation by investors as a result of scrutiny.

Figure OA.3. Investor response DNB Norge
This figure presents coefficient estimates and confidence intervals (95%) for the differences in **net flows** to the DNB Norge fund before, during and after the event window when comparing it to two different control groups: Scandinavian non-closet index funds and European closet index funds.



[1]For details see the article in DN (in Norwegian).

OA.4.2 Effect of policy intervention on net flows

Next, we compare fund flows for scrutinized Scandinavian closet indexers with both unaffected European closet indexers and Scandinavian non-closet indexers during the event, as well as assess the impact of the policy intervention employing a difference-in-differences framework. These findings are outlined in Table OA.4. In sum, we find no significant response to policy scrutiny in Scandinavian closet index funds compared to unaffected closet index funds or non-closet index funds.

Table OA.4. Effect of intervention on net flows
This table reports the effects of policy interventions on **net flows** for closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. Control group denotes the sample of funds used as control funds. Estimation is based on two-year pre-event and four-year post-event averages. The during column presents event differences between treated and control funds, and the difference-in-differences follows a classic setup, see Angrist and Pischke (2008) for details. Heteroskedasticity and autocorrelation-robust standard errors are in parentheses. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$

	Net flows			
Control group	European closet indexers		Scandinavian non-closet indexers	
Fund sample	During	Difference-in-differences	During	Difference-in-differences
Active share $\leq 40\%$	0.19	−0.89	−0.63	0.98
	(1.25)	(0.68)	(0.90)	(0.90)
Active share $\leq 50\%$	−0.16	0.19	−0.73	1.65**
	(1.00)	(0.69)	(0.76)	(0.76)

Finally, we investigate the investor response to the intervention within a panel regression framework in Table OA.5. Here we use the full sample of closet index funds and non-closet index funds. Our reasoning is that investors in Scandinavian funds do not have the same information set as the fund managers nor the realistic possibility of obtaining it. Thus, when allocating their capital, it is more difficult for investors, compared with the fund managers, to discern whether a given fund is a closet index fund subjected to scrutiny, or a truly actively managed fund.

Following, Scheld and Stolper (2023), we employ a triple interaction term to discern whether investors in Scandinavian funds were able to discriminate between true closet index funds and others relative to the control group when adjusting their capital allocation in response to policy scrutiny. First, as shown in Table OA.5, we find that the intervention had a negative and statistically insignificant effect on the overall flow to Scandinavian funds (*Intervention* × *Treated*). Thus, overall investors did not reciprocate in kind to the actions of the FSAs.

Second, the coefficients on the triple interaction term *Intervention* × *Treated* × *Closet indexer* are insignificant across all model specifications and even positive for the sample of closet index funds with active share below 50% at the onset of the event period. This suggests that investors did not discriminate between non-closet and closet index funds when allocation capital to treated funds in response to scrutiny by the FSAs.

In summary, these findings suggest that investors in the most scrutinized fund, DNB Norge, did not react more strongly to the policy intervention. Neither did investors in Scandinavian funds overall nor investors in Scandinavian closet index funds.

Table OA.5. Net flow - scrutiny relation

This table reports estimated slope coefficients from panel regressions that assess the impact of policy interventions on **net flows**. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. Additional control variables include fund size, age and fees. *Intervention* is a binary variable distinguishing the pre-event window from the post-event window. *Treated* is a binary variable separating Scandinavian funds from other European funds. *Closet Indexer* denotes whether a fund is considered a closet indexer prior to the event. The triple interaction term *Intervention* × *Treated* × *Closet Indexer* captures the difference-in-differences for the subsample of treated funds versus control group funds that are classified as closet indexers prior to the policy intervention. Reported coefficients from fund-month level observations. Standard errors (in parentheses) are clustered by fund and time. The sample is comprised of 14,528 fund-month observations. Statistical significance is denoted by asterisks: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

Fund sample	Active share ≤ 40%						Active share ≤ 50%					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Post	−0.30	0.63	−0.49	0.76			−0.20	0.50	−0.35	0.57		
	(0.67)	(0.69)	(0.68)	(0.95)			(0.69)	(0.70)	(0.70)	(0.90)		
Treated	0.84	1.08**					2.24***	2.08***				
	(0.55)	(0.53)					(0.74)	(0.68)				
Closet Indexer	−0.41	−0.18					0.41	0.06				
	(0.52)	(0.51)					(0.55)	(0.49)				
Intervention × Treated	−0.39	−0.51	−0.26	−0.61	−0.26	−0.55	−1.26	−1.26	−1.16	−1.45	−1.17	−1.39
	(0.64)	(0.64)	(0.66)	(0.74)	(0.66)	(0.75)	(0.86)	(0.85)	(0.87)	(0.93)	(0.87)	(0.91)
Intervention × Closet Indexer	0.37	0.41	0.58	0.70	0.61	0.68	0.01	0.20	0.07	0.37	0.09	0.33
	(1.27)	(1.33)	(1.31)	(1.31)	(1.33)	(1.34)	(1.01)	(1.05)	(1.06)	(1.00)	(1.07)	(1.00)
Treated × Closet Indexer	0.13	1.38*					−2.44***	−1.13				
	(0.75)	(0.73)					(0.84)	(0.71)				
Intervention × Treated × Closet Indexer	−0.71	−1.33	−0.93	−1.67	−0.97	−1.63	1.06	0.52	1.01	0.48	0.98	0.53
	(1.40)	(1.47)	(1.43)	(1.35)	(1.46)	(1.30)	(1.26)	(1.29)	(1.30)	(1.31)	(1.32)	(1.19)
Controls		×		×		×		×		×		×
Fund fixed effects			×	×	×	×			×	×	×	×
Time fixed effects					×	×					×	×
Adjusted R^2	0.00	0.02	0.04	0.04	0.11	0.11	0.01	0.02	0.04	0.04	0.11	0.11

OA.5 Additional analysis regarding impact on active share

OA.5.1 Testing for pre-trends

Table OA.6. Pre-trend active share

This table reports estimated slope coefficients (Post × t) derived from panel regressions assessing the existence of pre-trends in **active share** among closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. All regressions incorporate fixed effects for both fund and month, while Column 2 additionally accounts for factors such as fund age, size, and fees. Standard errors (in parentheses) are clustered by both fund and month. There are 2,112 and 3,183 fund-month observations in the 40% and 50% panels, respectively. Asterisks indicate statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Post × t	
Fund sample	(1)	(2)
Active share ≤ 40%	0.01	−0.07
	(0.08)	(0.08)
Active share ≤ 50%	−0.00	−0.05
	(0.06)	(0.07)
Controls		×

OA.5.2 Impact on active share based on fund characteristics

Table OA.7. Heterogeneity in the effect of intervention on active share

This table presents the heterogeneous impacts of policy interventions on the **active share** of closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. Funds are further divided into "high" and "low" groups based on the median values within their respective countries. The "high" and "low" columns display difference-in-differences estimates utilizing the high and low subsamples of treated and control funds, respectively. The "difference" column shows estimates derived from a triple difference-in-differences model. Heteroskedasticity and autocorrelation-robust standard errors are in parentheses. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

Fund sample	Active share $\leq 40\%$		
Fund characteristic	High	Low	Difference
Size	13.3***	20.32***	−7.01
	(3.39)	(4.77)	(6.09)
Age	15.21***	15.04***	0.16
	(3.45)	(3.22)	(4.66)
Fee	16.92***	14.25***	2.67
	(3.68)	(3.62)	(4.92)
Performance	14.54***	15.71***	−1.17
	(2.59)	(4.62)	(4.54)
Fund sample	Active share $\leq 50\%$		
Fund characteristic	High	Low	Difference
Size	7.88***	9.33*	−1.45
	(2.87)	(4.94)	(5.34)
Age	10.07***	6.42**	3.65
	(3.35)	(3.2)	(4.43)
Fee	7.27**	9.44***	−2.17
	(3.42)	(2.72)	(4.35)
Performance	7.96***	8.71**	−0.75
	(2.42)	(3.78)	(3.96)

OA.5.3 Impact on active share using fixed effects

Table OA.8. Active share-scrutiny relationship

This table reports estimated slope coefficients (Post × Scrutiny) derived from panel regressions that assess the impact of policy interventions on **active share** among closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. All regressions incorporate fund and month fixed effects, with columns 3 and 4 further controlling for fund age, size, and fees. Standard errors (in parentheses) are clustered by fund in columns 1 and 3, and independently by both fund and month in columns 2 and 4. The 40% and 50% panels are comprised of 4,217 and 6,368 fund-month observations each. Statistical significance is denoted by asterisks:
$^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Post × Scrutiny			
Fund sample	(1)	(2)	(3)	(4)
Active share ≤ 40%	15.16***	15.16***	17.74***	17.74***
	(2.43)	(2.43)	(3.08)	(3.08)
Active share ≤ 50%	8.29***	8.29***	6.56**	6.56**
	(2.05)	(2.03)	(3.04)	(3.01)
Controls			×	×
Fund cluster	×	×	×	×
Month cluster		×		×
Adj. R^2 [40% | 50%]	[0.69 | 0.69]		[0.72 | 0.69]	

OA.6 Appendix with additional analysis for impact on fee

OA.6.1 Testing for pre-trends

Table OA.9. Pre-trend fees

This table reports estimated slope coefficients (Post × t) derived from panel regressions assessing the existence of pre-trends in **fees** among closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. All regressions incorporate fixed effects for both fund and month, while column 2 additionally accounts for factors such as fund and family size, and age. Reported coefficients are annualized from fund-month level observations. Standard errors (in parentheses) are clustered by both fund and month. There are 2,112 and 3,183 fund-month observations in the 40% and 50% panels, respectively. Asterisks indicate statistical significance:
$^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Post × t	
Fund sample	(1)	(2)
Active share ≤ 40%	−0.00	−0.00*
	(0.00)	(0.00)
Active share ≤ 50%	−0.00	−0.00
	(0.00)	(0.00)
Controls		×

OA.6.2 Impact on fees based on fund characteristics

Table OA.10. Heterogeneity in the effect of intervention on fees

This table presents the heterogeneous impacts of policy interventions on the **fees** of closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. Funds are further divided into "high" and "low" groups based on the median values within their respective countries. The "high" and "low" columns display difference-in-differences estimates utilizing the high and low subsamples of treated and control funds, respectively. The "difference" column showcases estimates derived from a triple difference-in-differences model. Heteroskedasticity and autocorrelation-robust standard errors are in parentheses. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

Fund sample	Active share $\leq 40\%$		
Fund characteristic	High	Low	Difference
Size	−0.02	−0.11	0.08
	(0.05)	(0.11)	(0.14)
Age	−0.13*	0.03	−0.17
	(0.08)	(0.07)	(0.11)
Fee	−0.28***	0.11**	−0.39***
	(0.10)	(0.04)	(0.12)
Performance	−0.14	0.02	−0.16
	(0.09)	(0.05)	(0.10)
Fund sample	Active share $\leq 50\%$		
Fund characteristic	High	Low	Difference
Size	−0.01	0.02	−0.02
	(0.04)	(0.09)	(0.10)
Age	−0.09	0.09*	−0.18**
	(0.06)	(0.05)	(0.07)
Fee	−0.12**	0.12***	−0.24***
	(0.06)	(0.04)	(0.07)
Performance	−0.03	0.02	−0.05
	(0.06)	(0.05)	(0.08)

OA.6.3 Impact on fee using fixed-effects

Table OA.11. Fee-scrutiny relationship

This table reports estimated slope coefficients (Post × Scrutiny) from panel regressions that assess the impact of policy interventions on **fees** among closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. All regressions incorporate fund and month fixed effects, with columns 3 and 4 further controlling for fund age, and size. Reported coefficients are annualized from fund-month level observations. Standard errors (in parentheses) are clustered by fund in columns 1 and 3, and independently by both fund and month in columns 2 and 4. The 40% and 50% panels are comprised of 4,166 and 6,303 fund-month observations each. Statistical significance is denoted by asterisks: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Post × Scrutiny			
Fund sample	(1)	(2)	(3)	(4)
Active share ≤ 40%	−0.06	−0.06	−0.05	−0.05
	(0.06)	(0.06)	(0.06)	(0.06)
Active share ≤ 50%	−0.00	−0.00	0.03	0.03
	(0.04)	(0.04)	(0.05)	(0.05)
Controls			×	×
Fund cluster	×	×	×	×
Month cluster		×		×
Adj. R^2 [40% | 50%]	[0.91 | 0.92]		[0.90 | 0.91]	

OA.7 Additional analyses regarding impact on alpha

OA.7.1 Testing for pre-trends

Table OA.12. Pre-trend alpha

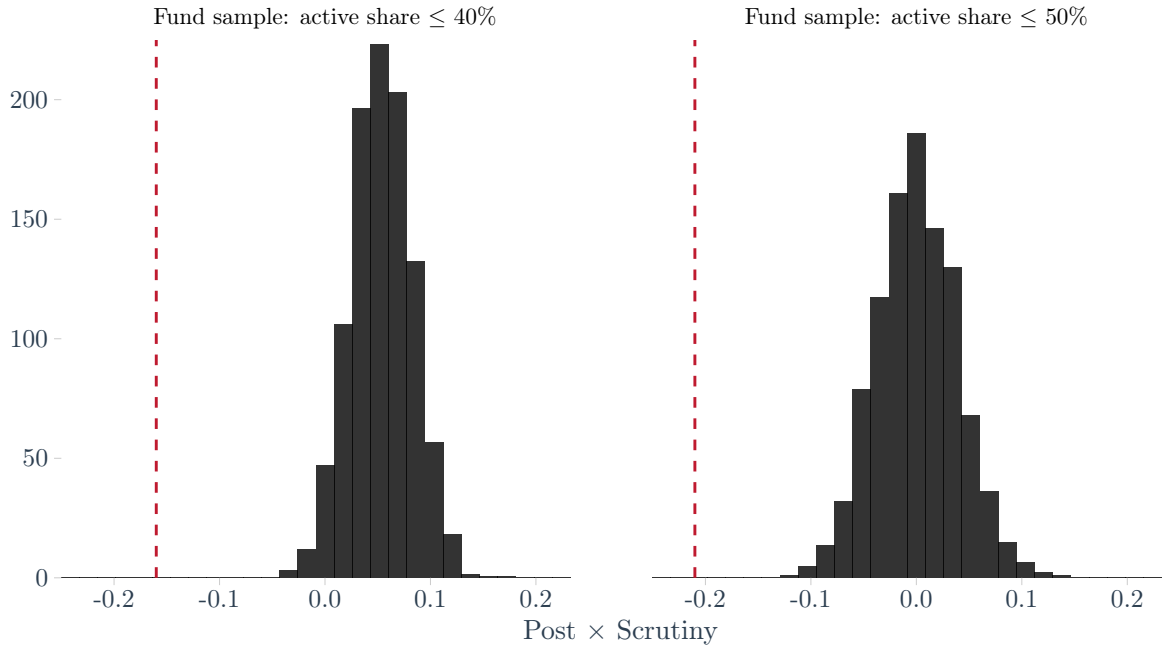
This table reports estimated slope coefficients (Post × t) derived from panel regressions assessing the existence of pre-trends in **alpha** among closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. All regressions incorporate fixed effects for both fund and month, while column 2 additionally accounts for factors such as fund age, size, active share, and fees. Standard errors, clustered by both fund and month, are presented in parentheses. There are 2,098 and 3,155 fund-month observations in the 40% and 50% panels, respectively. Asterisks indicate statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Post × t	
Fund sample	(1)	(2)
Active share ≤ 40%	−0.02*	−0.01
	(0.01)	(0.01)
Active share ≤ 50%	−0.01	−0.01
	(0.01)	(0.01)
Controls		×

OA.7.2 Placebo tests

Figure OA.4. Random assignment to treatment and control group

This figure presents histograms that illustrate the estimated coefficients of a falsification test conducted for the diff-in-diff model related to fund alpha. This test is equivalent to the one described in column 2 of Table 5. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. In each of the 1,000 separate estimations, the treatment and control groups are randomly assigned, adhering to a uniform distribution, with the ratio of treated to control being identical to that observed in the original sample (see Table 2). Subsequently, the model is re-estimated using the randomly assigned treatment variable. The reported coefficients correspond to the interaction term Scrutiny × Post. The dashed vertical lines indicate the corresponding coefficient estimates from Table 5, column 2.



OA.7.3 Impact on alpha based on fund characteristics

Table OA.13. Heterogeneity in the effect of intervention on alpha

This table presents the heterogeneous impacts of policy interventions on the **alpha** of closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. Funds are further divided into "high" and "low" groups based on the median values within their respective countries. The "high" and "low" columns display difference-in-differences estimates utilizing the high and low subsamples of treated and control funds, respectively. The "difference" column showcases estimates derived from a triple difference-in-differences model. Heteroskedasticity and autocorrelation-robust standard errors are in parentheses. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

Fund sample	Active share $\leq 40\%$		
Fund characteristic	High	Low	Difference
Size	-0.11^{**}	-0.12^{**}	0.01
	(0.05)	(0.06)	(0.09)
Age	-0.14^{***}	-0.18^{***}	0.03
	(0.04)	(0.06)	(0.07)
Fee	-0.21^{***}	-0.12^{***}	-0.09
	(0.05)	(0.04)	(0.06)
Performance	-0.15^{***}	-0.16^{***}	0.01
	(0.04)	(0.04)	(0.07)
Fund sample	Active share $\leq 50\%$		
Fund characteristic	High	Low	Difference
Size	-0.15^{**}	-0.17^{***}	0.01
	(0.06)	(0.06)	(0.08)
Age	-0.22^{***}	-0.19^{***}	-0.03
	(0.05)	(0.05)	(0.08)
Fee	-0.24^{***}	-0.17^{***}	-0.08
	(0.04)	(0.05)	(0.05)
Performance	-0.25^{***}	-0.16^{***}	-0.09
	(0.04)	(0.05)	(0.06)

OA.7.4 Value creation alternatives

Table OA.14. Effect of intervention on alternative measures of value creation

This table reports the consequences of policy interventions on monthly **net alpha** and **factor-adjusted alpha** for closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. Factor-adjusted alpha is based on the Fama-French 3-factor model. Estimation is based on two-year pre- and four-year post-event averages. The difference column presents post-event differences between treated and control funds. The difference-in-differences (DiD) follows a classic setup, see Angrist and Pischke (2008) for details. The reported coefficients are based on fund-month level observations. Heteroskedasticity and autocorrelation-robust standard errors are in parentheses. The asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Net alpha		Factor-adjusted alpha	
Fund sample	Difference	DiD	Difference	DiD
Active share $\leq 40\%$	-0.10^{***}	-0.15^{***}	-0.07^{**}	-0.06^{*}
	(0.02)	(0.03)	(0.03)	(0.03)
Active share $\leq 50\%$	-0.16^{***}	-0.20^{***}	-0.03	-0.07^{**}
	(0.03)	(0.04)	(0.03)	(0.03)

Table OA.15. Value creation-scrutiny relationship

This table presents estimated slope coefficients (Post × Scrutiny) derived from panel regressions that investigate the impact of policy interventions on net alpha (panel A) and factor-adjusted alpha (panel B) for closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. Factor-adjusted alpha is based on the Fama-French 3-factor model. All regressions use fund and month fixed effects, and columns 3 and 4, additionally controls for fund age, size, activity, and fees. The reported coefficients are based on fund-month observations. Standard errors (in parentheses) are clustered by fund in columns 1 and 3 and independently by both fund and month in columns 2 and 4. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Panel A: Net alpha			
Fund sample	(1)	(2)	(3)	(4)
Active share ≤ 40%	−0.14**	−0.14	−0.23***	−0.23**
	(0.03)	(0.09)	(0.07)	(0.11)
Active share ≤ 50%	−0.20***	−0.20**	−0.21***	−0.21**
	(0.03)	(0.10)	(0.05)	(0.09)
Controls			×	×
Fund cluster	×	×	×	×
Month cluster		×		×
Adj. R^2 [40% | 50%]	[0.10 | 0.10]		[0.11 | 0.10]	
	Panel B: Factor-adjusted alpha			
Fund sample	(1)	(2)	(3)	(4)
Active share ≤ 40%	−0.06	−0.06	−0.08	−0.08
	(0.04)	(0.09)	(0.06)	(0.10)
Active share ≤ 50%	−0.06**	−0.06	−0.03	−0.03
	(0.03)	(0.09)	(0.04)	(0.09)
Controls			×	×
Fund cluster	×	×	×	×
Month cluster		×		×
Adj. R^2 [40% | 50%]	[0.07 | 0.09]		[0.10 | 0.11]	

OA.8 Illustrating how active share influences alpha

This appendix presents a simplified example showing that the observed rise in active share is more than sufficient for subsequent underperformance in scrutinized Scandinavian closet index funds. In this example, we compare the difference in active share at one point in time (post-event), though we can extend the example to a diff-in-diff setting and a sub-portfolio setting.

Active share and capital exposed post-event

In our example, we define two countries, referred to as the "Treated country" and the "Control country", see Table OA.16. These countries represent the different countries in our sample, where one is Scandinavia and the remaining part of Europe is the other. Both countries have two stocks each, and they also have one fund each, named the "Treated fund" and the "Control fund". Both funds are domestic; that is, they invest in their home country. Consequently, the Treated fund invests in the two stocks in the Treated country and the Control fund invests in the two stocks in the Control country. The benchmarks are also distinct for the two funds, with the Treated fund having a benchmark with equally weighted stake in Stocks 1 and 2, whereas the Control fund has a benchmark with an equally weighted stake in Stocks 3 and 4. Consequently, there is no overlap in their investment universe.

Table OA.16. Portfolio composition post-event
The table presents the active exposure for each stock. The column labeled "Active" is the difference between the portfolio weight of the fund in stock i and the benchmark weight in stock i.

		Treated fund			Control fund		
		Fund	Benchmark	Active	Fund	Benchmark	Active
Treated country	Stock 1	0.93	0.50	0.43	0	0	0
	Stock 2	0.07	0.50	−0.43	0	0	0
Control country	Stock 3	0	0	0	0.78	0.50	0.28
	Stock 4	0	0	0	0.22	0.50	−0.28
Sum		1	1	0	1	1	0

In our example, we use numbers that match the paper's average figures. We see that the Treated fund (column 5) is overweight by 43% in Stock 1 and underweight in Stock 2. Using the formula for active share gives $AS = 43\%$. The fund can gain or lose relative to the benchmark in both overweight and underweight positions. The capital under exposure is therefore two times the active share.

For the Control fund, we find the corresponding numbers, overweight and underweight in Stock 3 and 4 at 28% (column 8). Active share is $AS = 28\%$ and the capital under exposure is twice the active share.

We find that active share is 43% for the treated fund and 28% for the control fund. This 15-percentage-point difference reflects the relative increase in active share during the post-event period among treated funds with an initial active share of 40% or less, compared to our control funds (see

Table 3). Table OA.17 shows the composition of the difference portfolios (treated and control), cf. Table OA.16, and the difference between the two.

Table OA.17. Portfolio composition post-event
The table presents the active exposure for each stock. The "Active diff. weight" column is the difference in the active weight of the treated fund in stock i and the active weight of the control fund in stock i.

		Active treated fund	Active control fund	Active diff. weight
Treated country	Stock 1	0.43	0	0.43
	Stock 2	−0.43	0	−0.43
Control country	Stock 3	0	0.28	−0.28
	Stock 4	0	−0.28	0.28
Sum		0	0	0

Since the funds have non-overlapping investment universes, the difference in their active shares does not capture the activity level driving the differences in alpha between them. The activity level of the difference between the active treated portfolio and the active control portfolio, which underpins the alpha difference, is the *sum* of their active shares, which is 71% (= 43% + 28%). Consequently, the capital exposed to generate these alpha differences is twice this sum.

Active share and alpha

Table 5 in the paper reports a difference in alpha of −0.10% between the active treated and active control portfolios in the post-event period. The relevant ratio when considering the monthly performance of the difference portfolio relative to the active exposure of this portfolio is

$$\frac{-0.10\%}{2 \cdot (43\% + 28\%)} = -0.070\%.$$

This corresponds to approximately −0.85% annually.

To shed some light on the number above, suppose that the stock alphas are as stated in Table OA.18. We can then explain the contribution of the stocks to the difference in alpha as follows:

Table OA.18. Contribution to the difference in alpha post-event
The table presents the active exposure for each stock and stock returns.

	Active diff. weight	Stock alpha	Contribution to difference in alpha
Stock 1	0.43	−0.070	$0.43 \cdot (-0.070) = -0.030$
Stock 2	−0.43	0.070	$-0.43 \cdot 0.070 = -0.030$
Stock 3	−0.28	0.070	$-0.28 \cdot 0.070 = -0.020$
Stock 4	0.28	−0.070	$0.28 \cdot (-0.070) = -0.020$
Sum	0		−0.10

OA.9 Scandinavian non-closet index funds as control group

As an alternative control group, we use another group of funds that are not under scrutiny. This group consists of Scandinavian non-closet index funds. However, these funds have different characteristics. If we consider closet indexing to be a disease, contrasting closet index funds and non-closet index funds is tantamount to comparing sick funds with healthy ones. Such a comparison introduces a selection bias. Fund fixed effects may partly remedy this problem. As a robustness test of our main results, we perform the same analyses as previously.

In Table OA.19, we present the same summary statistics as in Table 2, but now Scandinavian non-closet index funds comprise the control group. There are three main differences between the samples. First, the active share is lower for the closet index funds. Second, even if not by much (about 24 basis points annually), the group of closet index funds is cheaper than non-closet index funds. Finally, the closet index funds are older. This confirms that closet index funds may often be old funds with uninformed investors.

Another lesson from this analysis is that the underperformance in Scandinavian closet index funds forced to increase activity is not only caused by characteristics of Scandinavian stocks, such as high trading costs. The underperformance holds even if managers have a similar activity level and trade in the same stocks.

Table OA.19. Summary statistics for Scandinavian funds pre-event

This table presents summary statistics for the sample of actively managed domestic equity mutual funds in Scandinavia (Denmark, Norway, and Sweden). Scandinavian non-closet indexers are designated as the control group. The values presented are means over a two-year period preceding the start of the event. Expense ratios are annualized. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. Inference on differences between treatment and control funds is based on heteroskedasticity and autocorrelation-robust standard errors. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

Fund sample	Active share $\leq 40\%$			Active share $\leq 50\%$		
Group	Treated	Control	Difference	Treated	Control	Difference
Number of funds	42	108		75	75	
Active share (%)	28.10	60.78	-32.68^{***}	37.08	66.05	-28.97^{***}
Gross alpha (%)	0.04	0.05	0.01	0.07	0.03	0.04
Expense ratio (%)	1.14	1.44	-0.30^{**}	1.27	1.44	-0.17
AUM (million USD)	586	218	368^{**}	394	265	129
Fund age (years)	17.7	11.6	6.1^{***}	15.3	11.3	4.0^{*}

In Tables OA.20 and OA.21 we present how scrutiny influences closet index funds relative to non-closet index funds.

Table OA.20. Robustness: effect of intervention on main outcomes

This table reports the consequences of policy interventions on **active share**, **fees** and **alpha** for closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. The control group comprises Scandinavian non-closet indexers, and the estimation relies on two-year pre-event averages and four-year post-event averages. In the difference column, we present the post-event differences between treated and control funds. The difference-in-differences (DiD) follows a classic setup, see Angrist and Pischke (2008) for details. Reported coefficients for fees are annualized from fund-month level observations. Heteroskedasticity and autocorrelation-robust standard errors are in parentheses. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Active share		Fees		Alpha	
Fund sample	Difference	DiD	Difference	DiD	Difference	DiD
Active share $\leq 40\%$	-28.28^{***}	9.68^{***}	-0.43^{***}	-0.12^{*}	-0.16^{***}	-0.18^{**}
	(2.67)	(2.51)	(0.07)	(0.06)	(0.05)	(0.08)
Active share $\leq 50\%$	-26.67^{***}	2.24	-0.25^{***}	-0.07	-0.19^{***}	-0.22^{***}
	(1.95)	(1.93)	(0.06)	(0.05)	(0.05)	(0.08)

Table OA.21. Robustness: main outcomes-scrutiny relationship
This table reports estimated slope coefficients (Post × Scrutiny) from panel regressions testing the effects of policy interventions on **active share** (panel A), **fees** (panel B), and **alpha** (panel C) for closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. The control group comprises Scandinavian non-closet indexers. All regressions include fund and month fixed effects, and columns 3 and 4 additionally controls for fund age, size, and fees (not in panel B). Reported coefficients for fees are annualized from fund-month level observation. Standard errors (in parentheses) clustered by fund are reported in columns 1 and 3 and independently by fund and month in columns 2 and 4. Asterisks denote statistical significance: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Panel A: Active share			
Fund sample	(1)	(2)	(3)	(4)
Active share ≤ 40%	9.67***	9.67***	9.13***	9.13***
	(2.36)	(2.38)	(2.54)	(2.54)
Active share ≤ 50%	2.21	2.21	1.73	1.73
	(1.93)	(1.93)	(2.00)	(1.99)
Controls			×	×
Fund cluster	×	×	×	×
Month cluster		×		×
Adj. R^2 [40% | 50%]	[0.88 | 0.85]		[0.89 | 0.86]	
	Panel B: Fee			
Fund sample	(1)	(2)	(3)	(4)
Active share ≤ 40%	−0.12*	−0.12*	−0.05	−0.05
	(0.06)	(0.06)	(0.08)	(0.08)
Active share ≤ 50%	−0.07	−0.07	−0.03	−0.03
	(0.05)	(0.05)	(0.06)	(0.06)
Controls			×	×
Fund cluster	×	×	×	×
Month cluster		×		×
Adj. R^2 [40% | 50%]	[0.78 | 0.79]		[0.75 | 0.77]	
	Panel C: Alpha			
Fund sample	(1)	(2)	(3)	(4)
Active share ≤ 40%	−0.16**	−0.16	−0.21*	−0.21
	(0.07)	(0.13)	(0.10)	(0.18)
Active share ≤ 50%	−0.21***	−0.21*	−0.21**	−0.21
	(0.07)	(0.12)	(0.08)	(0.14)
Controls			×	×
Fund cluster	×	×	×	×
Month cluster		×		×
Adj. R^2 [40% | 50%]	[0.07 | 0.07]		[0.07 | 0.07]	

OA.10 Additional analysis regarding signal jamming

Table OA.22. Portfolio concentration-scrutiny relationship
This table reports estimated slope coefficients (Post × Scrutiny) from panel regressions that assess the impact of policy interventions on **portfolio concentration** among closet index funds. Fund sample denotes the active share cutoff limit used to classify funds as closet indexers. All regressions incorporate fund and month fixed effects, with columns 3 and 4 further controlling for fund age, and size. Reported coefficients are annualized from fund-month level observations. Standard errors (in parentheses) are clustered by fund in columns 1 and 3, and independently by both fund and month in columns 2 and 4. The 40% and 50% panels are comprised of 4,217 and 6,368 fund-month observations each. Statistical significance is denoted by asterisks: $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Post × Scrutiny			
Fund sample	(1)	(2)	(3)	(4)
Active share ≤ 40%	6.38**	6.38**	6.93*	6.93*
	(3.00)	(2.98)	(4.09)	(4.06)
Active share ≤ 50%	3.16*	3.16*	2.55	2.55
	(1.73)	(1.72)	(2.05)	(2.03)
Controls			×	×
Fund cluster	×	×	×	×
Month cluster		×		×
Adj. R^2 [40% | 50%]	[0.51 | 0.50]		[0.50 | 0.49]	

References

Angrist, J. D. and Pischke, J.-S. (2008), *Mostly harmless econometrics*, Princeton university press.

ESMA (2020), 'Closet indexing indicators and investor outcomes'. Available at https://web.archive.org/web/20240913123347/https://www.esma.europa.eu/sites/default/files/library/esmawp-2020-2_closet_indexing.pdf.

Financial Supervisory Authority of Norway (2015), 'Management of equity fund – corrective order'. Available at https://web.archive.org/web/20240913123920/https://www.finanstilsynet.no/en/news-archive/news/2015/management-of-equity-fund--corrective-order/, Last accessed on 2024-03-29.

Norwegian Consumer Council (2015), 'Consumer Council sues Norway's largest bank'. Available at https://web.archive.org/web/20240913125618/https://www.forbrukerradet.no/side/consumer-council-sues-norways-largest-bank-on-behalf-of-180000-consumers/, Last accessed on 2024-03-29.

Scheld, D. and Stolper, O. (2023), 'Leveling the playing field? the effect of disclosing fund manager activeness to individual investors', *Journal of Banking & Finance* **154**, 106915.