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Indexing and active fund management: International evidence

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ABSTRACT

We examine the relation between indexing and active management in the mutual fund industry worldwide. Explicit indexing and closet indexing by active funds are associated with countries' regulatory and financial market environments. We find that actively managed funds are more active and charge lower fees when they face more competitive pressure from low-cost explicitly indexed funds. A quasi-natural experiment using the exogenous variation in indexed funds generated by the passage of pension laws supports a causal interpretation of the results. Moreover, the average alpha generated by active management is higher in countries with more explicit indexing and lower in countries with more closet indexing. Overall, our evidence suggests that explicit indexing improves competition in the mutual fund industry.

1. Introduction

Practitioners and academics have long debated the societal benefits and degree of competition in the asset management industry,[1] particularly among equity mutual funds. This debate has focused primarily on two dimensions: the relative value of passive versus active

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management and the question of price competition in the mutual fund industry.[2] In this paper, we contribute to this debate by examining actively and passively managed equity mutual funds in 32 countries. Elucidating this debate is particularly important because much of the recent growth in assets in the mutual fund industry has been in explicitly indexed equity funds [index funds and exchange-traded funds (ETFs)], which have grown from constituting about 14% of assets under management in 2002 to about 22% in 2010. These explicitly indexed funds have thus become a common low-cost alternative for investors to access the stock market, allowing them to buy beta exposure (i.e., investing in a diversified portfolio tracking a stock index) at substantially lower fees compared with active funds.

In a Grossman and Stiglitz (1980) world, one would expect passive and active funds to coexist in equilibrium with their relative market shares depending on information costs and overall market efficiency. Thus, the empirical observation of flows into explicitly indexed funds has implications for how such an equilibrium would be expected to change. Coates and Hubbard (2007) and Khorana and Servaes (2012) suggest that mutual fund markets in the United States and elsewhere are competitive, but that they have different levels of competition.[3] In addition, Wahal and Wang (2011) show that the entry of new active funds that are close substitutes to incumbent funds creates competitive pressure for the incumbent funds to decrease their fees. We build on this evidence and hypothesize that increasing competition from indexed funds will lead active funds to compete via price (by lowering their fees) or product differentiation (by diverging more from their benchmark index) or both. This competitive pressure could benefit fund investors directly through lower fees and indirectly through stronger incentives for skilled active managers to collect information and generate alpha.

The alternative hypothesis is that active and passive fund markets are largely segmented such that investors do not consider these fund types to be substitutes. Instead the investors could perceive active funds as differentiated investment vehicles, which then have higher fees as compensation for alpha generation or for satisfying different investor needs than what is delivered by passive funds.[4] In this case, increasing market shares for indexed funds might not lead to lower fees and higher differentiation by the active funds. Such an outcome would be similar to the generics paradox phenomenon in the pharmaceutical industry, in which researchers have shown that the introduction of generic drugs (which would be analogous to index funds and ETFs in our context) does not necessarily lead to the expected price drops by the branded drugs (which would be analogous to fees of active funds in our context).[5]

In segmented mutual fund markets in which active funds face reduced inflows to their market segment due to the increased presence of index funds, the active funds could increase fees to cover higher marketing expenses. In addition, as the active fund managers care about their relative performance vis-à-vis benchmark indices (Basak and Pavlova, 2013), an increased fear of losing more assets could lead managers to increase the fraction of stocks in the portfolio that belong to their benchmark indices to avoid underperformance. Consistent with this alternative hypothesis, Wurgler (2011) argues that the growth of index-based investing could allow stock prices to be more divorced from the firms' fundamentals, thereby lowering fund managers' incentives to gather information, in which case the managers' funds could perform worse. Thus, the alternative hypothesis posits that an increased market share of indexed funds will lead to active fund managers maintaining their current investment strategy or even becoming less active and resisting downward pressure on their fees. (This argument is based on price effects that are associated with a stock being included in a popular benchmark index. Further, if demand shocks for stocks included in the index lead to sustained price premiums for these stocks, it becomes harder for active managers to outperform by buying stocks that are not included in the index.)

Our multi-country sample with equity mutual funds and ETFs from 32 countries is an ideal testing ground for these hypotheses due to the wide variation in conditions across markets and the fact that financial markets tend to be segmented across countries (e.g., Stulz, 2005). We consider the segmentation in the mutual fund industry through consideration of the countries in which funds are domiciled or sold.

We first document the extent of explicit indexing in each country, finding considerable cross country and time series variation. Over our sample period, the market share of explicitly indexed funds grew from 14% of assets under management in 2002 to 22% in 2010, with the popularity of explicit indexing particularly rising after the 2007–2008 financial crisis. However, not all indexing in mutual funds is necessarily explicit as some so-called active funds are largely passively managed, even if their managers market the funds and charge fees as if they are active (a practice

[2] For evidence on the value of active management in the mutual fund industry, see, for example, Sharpe (1966), Jensen (1968), Grinblatt and Titman (1989, 1993), Gruber (1996), Wermers (2000), Bollen and Busse (2001), Kacperczyk, Sialm, and Zheng (2005), Avramov and Wermers (2006), Kosowski, Timmermann, Wermers, and White (2006), Kacperczyk and Seru (2007), French (2008), Cremers and Petajisto (2009), and Busse, Goyal, and Wahal (2014). For evidence on competition in the industry, see for example, Elton, Gruber, and Busse (2004), Hortacsu and Syverson (2004), Collins (2005), Coates and Hubbard (2007), Gil-Bazo and Ruiz-Verdu (2009), Wahal and Wang (2011), and Khorana and Servaes (2012).

[3] Some research suggests that perfect competition might not exist in the mutual fund industry or that mutual funds could be perceived as differentiated goods by retail investors due to sizable information and search frictions or investor irrationality (Elton, Gruber, and Busse, 2004; Hortacsu and Syverson, 2004; Choi, Laibson, and Madrian, 2010; Carlin and Manso, 2011).

[4] Collins (2005) argues that funds can differ, for example, on the services provided to fund shareholders. And even if investors care only about returns, passive funds are not pure substitutes to active funds because of the potential for alpha. Berk and Green (2004) and Pastor and Stambaugh (2012) argue that fund managers can have skill and investors invest in active funds even in the absence of ex post average positive alphas.

[5] The empirical literature on generic drugs finds that generics are cheaper and gain market share, but their entry does not result in lower prices for the branded drugs. See, for example, Frank and Salkever (1997) and Vandoros and Kanovos (2012). *The Economist* (2014) makes a similar analogy between indexed funds and white-label goods.

that is commonly termed "closet indexing"). To examine this behavior, we use fund portfolio holdings to calculate the Cremers and Petajisto (2009) active share measure, which captures the proportion of a fund's holdings that differs from its benchmark. If fund holdings largely overlap with index holdings, investors are effectively earning index-like gross returns (the beta part of return), which they could obtain at lower fees through explicitly indexed funds. Our results show that closet indexing is common. Defining closet indexers as funds with an active share below 60% [following the cutoff established in Cremers and Petajisto (2009)], we find that about 20% of the worldwide mutual fund assets are managed by closet indexers.[6] Our results are similar when we consider alternative measures of activeness, such as measuring a fund's active share against the portfolio of active funds that track a fund's benchmark. This alternative measure is inspired by the overlap measure of Wahal and Wang (2011).

Our tests regarding the effects of explicit indexing (in terms of market share and shareholder costs) support the hypothesis that increased competition from explicit indexing benefits investors in active funds. We find that active funds have higher active shares and charge lower fees in markets with more explicit indexing. In contrast, active funds charge higher fees in countries with more closet indexing. These differences are economically important. For example, a decline in the fees of indexed funds by 50 basis points is associated with 16 basis points lower fees charged by active funds.

One potential concern regarding our empirical tests is that explicitly indexed funds' market shares and costs are likely jointly determined with active funds' active share and fees. We show that the results are robust when we use benchmark and country fixed effects to address the concern that the availability of explicit indexing could be related to some unobserved (and time invariant) benchmark or country characteristic that explains the active share and fees of active funds. To further address this potential endogeneity issue we consider a quasi-natural experiment, i.e., the staggered passage of pension legislation in many of the countries in our sample. These Pension Acts generally aim to facilitate a shift from government-sponsored defined benefit (DB) pension systems towards defined contribution (DC) pension systems and include policy changes designed to increase market competition, such as easy access to mutual funds that offer market exposure (for example, by offering at least one passive fund in the menu of investment options). *The Economist* (2014) argues that, with these Pension Acts, "governments are also pushing pension providers to opt for low-cost funds.…Such measures make it likely that more investments will flow into tracker funds." The Pension Acts help to resolve the endogeneity problem to the extent that their timing should be largely related to legislative agendas in particular countries, not driven by fund industry conditions.

We use a differences-in-differences estimator that compares the differences in outcomes in the group of countries before and after the year of a country's Pension Act passage versus a control group that contains all countries not passing a Pension Act in the same year. Using this approach, we find that active funds increase their active share and decrease their fees following the passage of a Pension Act in their country of domicile or sale.

Finally, we examine performance as a result of investing in truly active funds and whether the performance relates to the availability of explicitly indexed products. Thus, we first measure the ability of the active funds in these markets not just to provide beta exposure but also to generate alpha. We find that a fund's active share predicts its future risk-adjusted performance. The effect is economically significant: A one standard deviation increase in active share is associated with an increase of about 1% per year in benchmark-adjusted returns and 0.7% per year in four-factor alpha. These results for an international sample are consistent with the earlier Cremers and Petajisto (2009) results for the US market.

Next and more important, we provide evidence that the average alpha generated by active management is higher in countries in which low-cost passive alternatives are more popular, while the average alpha is lower in markets where closet indexing is more prevalent. Overall, our evidence suggests that enhanced competitive pressure from index funds and ETFs creates more incentives for skilled managers to pass on alpha to fund investors and closet indexing has the opposite effect.

In sum, our findings suggest that the availability of explicit indexing is associated with improved levels of competition in a fund industry and closet indexing is indicative of the reverse. Previous evidence regarding competition in the mutual fund industry has primarily focused on the US market (e.g., Wahal and Wang, 2011). The few papers analyzing the mutual fund industry worldwide have so far focused on the determinants of industry size and fees across countries. Khorana, Servaes, and Tufano (2005, 2009) find a positive link between the level of development of fund industries worldwide and a combination of legal, regulatory, and demand- and supply-side factors. To the best of our knowledge, we are the first to study how indexing is related to the structure and performance of actively managed mutual funds around the world.

2. Data and variables

Our analysis uses two primary databases: Lipper and FactSet/LionShares. The Lipper database provides a comprehensive sample of mutual funds offered across a large number of countries. Mutual funds, while taking a variety of names around the globe, are fairly comparable investment vehicles worldwide (Khorana, Servaes, and Tufano, 2005). We focus exclusively on open-end equity mutual funds and exchange-traded funds in the 2002–2010 period. From this database, we obtain individual fund characteristics, such as fund name, domicile, sponsor, benchmark, monthly returns, total net assets (TNA), fees, and expenses.

[6] A manager who tries to beat the benchmark should have a minimum active share of at least 50%, since half the assets (by weight) in the benchmark will have a return above the benchmark return (which is the asset-weighted average return of the assets in the benchmark). We obtain consistent results when we use a 50% cutoff, instead of the 60% cutoff we use throughout the analysis.

The data are survivorship bias-free, as they include both active and defunct funds. Although multiple share classes are listed as separate observations in Lipper, they have the same holdings and the same returns before expenses. Thus, we keep as our unit of observation the share class that Lipper identifies as the primary share class and aggregate fund-level variables across the different share classes. We also conduct some tests using the individual share classes.[7]

The sample has 24,492 funds with a combined TNA totaling over $9.8 trillion as of December 2010. This means that mutual funds held roughly 20% of world stock market capitalization. We identify funds' nationalities by their legal domicile, which characterizes the relevant regulatory and legal system. Table 1 lists the countries or regions with at least 50 funds, including the three countries with offshore domiciles (Ireland, Liechtenstein, and Luxembourg).[8]

The LionShares database covers portfolio equity holdings for institutional investors worldwide, including mutual funds and ETFs. Ferreira and Matos (2008) provide a detailed description of this data source. We match the Lipper (fund characteristics and performance) and LionShares (fund holdings) databases by CUSIP (Committee on Uniform Security Identification Procedures), ISIN (International Securities Identification Number) or fund name.

Panel A of Table 1 provides key statistics on the sample of funds for which portfolio holdings are available by country of domicile as of December 2010. It shows that detailed holdings are available from LionShares for 11,776 funds with TNA of approximately $7.9 trillion. In total, we have holdings data from the LionShares database for about 81% of the TNA in the Lipper database, but coverage varies across countries.[9]

We control for fund and country characteristics in our subsequent tests. Table IA1 in the Internet Appendix provides summary statistics of all variables for the sample of open-end active equity funds in the 2002–2010 period, and Table IA2 reports time series averages of country variables per country. Appendix A provides all variable definitions.

3. Explicit and closet fund indexing around the world

In this section we provide descriptive information regarding the extent of explicit indexing, closet fund indexing, and truly active management in different countries. We report the number of funds, total net assets, market share and total shareholder cost for each investment strategy in each country.

3.1. Explicit indexing

Panel A of Table 1 reports the number of funds per country using the funds' declared investment type according to their prospectus disclosures as of December 2010. The total of 1,218 explicitly indexed funds consists of 561 ETFs and 657 traditional index funds with $1.7 trillion in assets under management ($0.8 trillion in ETFs and $0.9 trillion in index funds) at the end of our sample period.[10] There are also 10,558 active funds with $6.2 trillion in assets under management. Although passively managed funds have become increasingly popular, active funds still vastly dominate mutual fund markets throughout the world.

Before testing our hypotheses on the effects of explicitly indexed funds on a country's fund industry, we show the availability of explicitly indexed funds across the different countries. Panel A of Table 1 reports that 22% of equity mutual fund assets under management worldwide are explicitly indexed as of 2010. For many funds in our sample, the country of domicile corresponds to the single country of sale, while other funds are registered for sale in multiple countries. These multi-country registrations create competition across domiciles.

Panel B of Table 1 provides the key statistics for our sample alternatively based on the fund share class by country of sale at the end of our sample period.[11] While Panel A shows that some countries have no passively managed funds domiciled in their country, Panel B shows that the competitive landscape for funds is much broader when the country of sale is considered because large asset managers domiciled in particular in Ireland (Luxembourg) offer their index (active) funds across European markets. While both Panels A and B suggest that roughly one-fifth of equity fund assets are explicitly indexed, substantial variation appears across countries.[12] Because of the different advantages and disadvantages of the two perspectives, we adopt both country of domicile and country of sale in our tests.

[7] In the European Union, mutual funds fall under the umbrella of UCITS (Undertakings for Collective Investment in Transferable Securities), a regulatory attempt to harmonize investment vehicles across the EU.

[8] Lipper's coverage of funds can be compared with aggregate statistics on mutual funds from other sources. As of December 2010, the Investment Company Institute (2011) reported a total of 27,754 equity mutual funds worldwide with a TNA of $10.5 trillion. Therefore, we conclude that the Lipper sample covers almost all of the equity mutual fund universe.

[9] LionShares coverage of fund holdings is lower in some countries because disclosure is not mandatory. We obtain similar results when we exclude these countries and conclude that our results are not driven by selective disclosure.

[10] We recognize that ETFs can be used by investors for market timing and other investment strategies beyond purely beta exposure. Thus, they might not always be viewed as substitute investment products relative to active funds. Because they are an important source of beta exposure for many investors, we combine them together with index funds and define both as the set of explicitly indexed funds available to investors.

[11] Table IA3 in the Internet Appendix provides details on the number of share classes by country of domicile and country of sale in 2010. Because some funds have multiple share classes and are offered in more than one country, we can have multiple observations for the same fund in a given year. For each fund share class, Lipper provides the list of countries where it is approved for sale but does not have the exact amount of shares that were sold to each market. We basically multiply each fund share class for each country of sale and that causes some duplication. Some aggregate totals in Panel B of Table 1 suffer from this issue.

[12] The calculation of the market share of explicitly indexed funds does not require LionShares holdings data. To investigate the possibility of selection bias from using the sample of 11,776 funds with holdings data in LionShares, we calculate the market share of explicit indexing using the sample of 24,492 funds in Lipper (i.e., including those without holdings data). The degree of explicit indexing is similar to that reported in Table 1.

Table 1
Explicit and closet indexing by country of domicile and country of sale.

This table presents the number of funds and total net assets (TNA) in billions of US dollars per country as of December 2010 for the sample of open-end equity mutual funds in Lipper for which holdings are available in LionShares. Explicit indexing includes index funds and exchange-traded funds. Closet indexing includes active funds with active share below 0.6. Truly active includes active funds with active share above 0.6. Total shareholder cost is the annual total expense ratio plus one-fifth of the front-end load. Panel A presents statistics based on the primary fund country of domicile, and Panel B presents statistics based on the fund share class country of sale.

Funds with holdings		Explicitly indexed funds		Active funds		Market share (%TNA)			Total shareholder cost (%)		
Country	Number	TNA (billions of dollars)	Number	TNA (billions of dollars)	Number	TNA (billions of dollars)	Explicit indexing	Closet indexing	Truly active	Explicit indexing	Closet indexing	Truly active
Panel A: By country of domicile												
Austria	167	15.0	11	0.5	156	14.5	3	36	61	2.23	2.58	2.61
Belgium	150	17.9	24	3.7	126	14.2	21	43	36	1.16	2.01	1.98
Canada	895	326.4	53	24.4	842	302.0	8	37	55	0.42	2.11	2.80
Denmark	201	30.5	12	0.5	189	30.0	2	27	71	0.83	1.87	2.09
Finland	147	26.2	8	0.8	139	25.4	3	44	53	0.34	2.16	1.91
France	492	134.1	89	33.8	403	100.3	25	29	46	0.77	2.07	2.22
Germany	356	139.5	51	22.3	305	117.2	16	34	50	0.69	2.34	2.37
Ireland	484	222.5	62	68.8	422	153.7	31	25	44	0.56	1.89	2.17
Italy	125	31.4	0	0.0	125	31.4	0	36	64		2.44	2.59
Liechtenstein	101	6.0	0	0.0	101	6.0	0	18	82		1.70	1.98
Luxembourg	2,057	750.5	107	30.7	1,950	719.8	4	26	70	1.21	2.60	2.43
Netherlands	75	33.6	3	0.3	72	33.3	1	21	78	0.59	1.40	1.30
Norway	117	41.4	8	2.6	109	38.8	6	26	68	0.42	1.44	1.82
Poland	46	8.4	0	0.0	46	8.4	0	58	42		4.02	3.00
Portugal	53	2.0	1	0.0	52	2.0	0	39	61	1.03	2.01	2.08
Spain	267	13.1	27	1.2	240	11.9	9	42	49	1.51	2.12	1.97
Sweden	266	113.5	36	11.7	230	101.8	10	56	34	0.56	1.47	1.42
Switzerland	220	69.7	45	40.6	175	29.1	58	24	18	1.01	1.73	2.08
United Kingdom	975	504.1	46	45.6	929	458.5	9	32	59	0.62	2.33	2.38
United States	3,153	5,150.3	547	1,393.2	2,606	3,757.1	27	15	58	0.26	1.07	1.31
Asia Pacific	1,204	255.5	86	62.3	1,118	193.2	24	20	56	0.75	1.46	1.90
Other regions	225	29.3	2	0.1	223	29.2	0	41	59	1.35	2.14	2.08
Total	11,776	7,921.1	1,218	1,743.2	10,558	6,177.9	22	20	58	0.35	1.64	1.66
Panel B: By country of sale												
Austria	5,861	1,020	269	114.9	5,592	904.9	11	24	65	0.76	2.61	2.53
Belgium	3,301	519	154	20.9	3,147	498.1	4	27	69	0.90	2.82	2.74
Canada	2,114	326	82	24.3	2,032	302.1	7	37	55	0.41	2.11	2.78
Denmark	2,741	476	65	55.8	2,676	420.6	12	26	62	0.53	2.65	2.58
Finland	3,973	582	115	35.9	3,858	545.8	6	28	66	0.88	2.67	2.56
France	6,269	1,024	370	137.7	5,899	886.7	13	24	62	0.68	2.54	2.53
Germany	7,360	1,186	399	149.5	6,961	1,036.1	13	24	63	0.71	2.53	2.48
Ireland	2,846	595	156	87.9	2,690	507.4	15	24	62	0.63	2.48	2.49
Italy	4,359	706	189	51	4,170	654.9	7	27	66	0.84	2.69	2.62
Liechtenstein	60	1	8	0.0	52	1.3	0	31	69	1.61	2.59	2.54
Luxembourg	7,485	1,048	355	125.2	7,130	922.6	12	24	64	0.77	2.58	2.43
Netherlands	5,194	900	267	134.8	4,927	765.1	15	22	63	0.63	2.58	2.49
Norway	3,324	482	40	7.6	3,284	474.7	2	31	68	0.70	2.55	2.59
Poland	1,755	233	0	0.0	1,755	233.0	0	30	70		2.84	2.64
Portugal	3,390	440	90	7.5	3,300	432.6	2	30	68	1.45	2.71	2.70
Spain	5,359	806	215	84.7	5,144	721.1	11	25	64	0.69	2.66	2.57
Sweden	5,311	856	248	96.1	5,063	760.0	11	27	62	0.72	2.30	2.43
Switzerland	6,809	1,106	387	170.9	6,422	934.6	15	21	63	0.78	2.55	2.46
United Kingdom	6,924	1,307	329	161.8	6,595	1,145.5	12	26	62	0.65	2.47	2.42
United States	8,976	5,079	918	1,392.1	8,058	3,686.6	27	15	58	0.25	1.09	1.32
Asia Pacific	8,675	2,103	220	520.6	8,455	1,582.5	25	18	57	0.31	2.63	2.61
Other regions	542	163	3	0.1	539	163.1	0	25	75	1.36	2.64	2.80
Other countries	21,294	5,661	692	1,457.2	20,602	4,203.3	26	22	52	0.28	2.34	2.49
Total	123,922	26,620	5,571	4,836.8	118,351	21,782.7	18	22	60	0.40	2.33	2.30

3.2. Active funds and closet indexing

We differentiate active management versus closet indexing using the active share measure developed by Cremers and Petajisto (2009). The measure represents the share of portfolio holdings that differs from the benchmark index holdings and is calculated as

$$\text{Active share} = \frac{1}{2}\sum_{i=1}^{N} |w_{\text{fund},i} - w_{\text{benchmark},i}|, \quad (1)$$

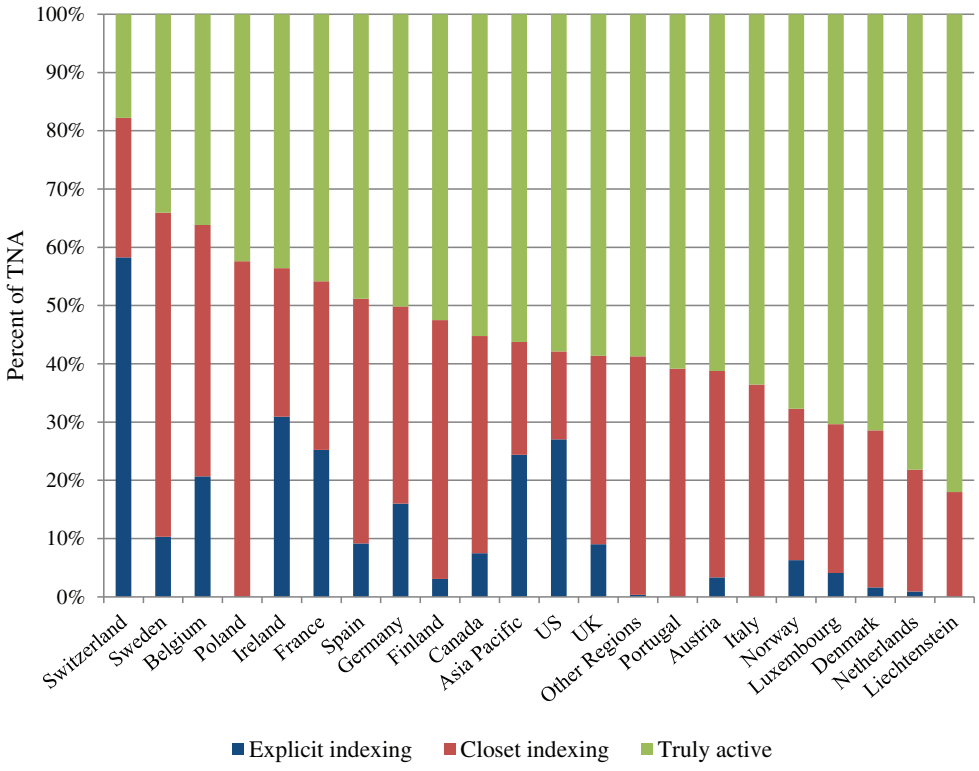


Fig. 1. Explicit and closet indexing by country of domicile. This figure shows the percentage that explicitly indexed funds represent of the total net assets (TNA) in a country (explicit indexing), the percentage that active funds with active share measure below 0.6 represent of the TNA in a country (closet indexing), and the percentage that active funds with active share measure above 0.6 represent of the TNA in a country (truly active), as of December 2010. The sample includes open-end equity mutual funds from Lipper for which holdings are available in LionShares.

where $w_{\text{fund},i}$ and $w_{\text{benchmark},i}$ are the portfolio weights of stock i in the fund and its benchmark index, respectively, and the sum is taken over the universe of stocks. For a mutual fund that does not short stocks or buy on margin, its active share will always lie between zero and 100%. Given our international setting, funds can hold different securities in the same company (e.g., common shares, depository receipts, and dual listings) that represent the same stake in a company. We therefore sum all equity holdings in the same company as part of the portfolio position

Our analysis of active management requires the identification of funds' benchmarks. We use benchmarks independently assigned by Lipper according to its assessment of a fund's investment strategy.[13] Table IA4 in the Internet Appendix lists the 88 benchmarks, which can be classified into three types: world (funds that invest worldwide), regional (funds that invest in a specific geographic region), and country (funds that invest in a specific country). Some of the world, regional, and country funds can have specific industry or investment styles. We keep benchmarks only with at least $10 billion of assets under management in 2010. For some countries with less than $10 billion of assets under management, we keep the major country index as the benchmark.

We construct portfolio weights for the 88 different benchmark indices using the aggregate portfolio holdings of the explicitly indexed funds tracking each benchmark.[14] Therefore, the active share is measured in excess of explicitly indexed funds. Using the actual weights of explicitly indexed funds tracking each benchmark has the advantage that some of the weights in the official benchmark include stocks that, in practice, might not be fully investable by mutual funds due to illiquidity or other constraints. On average (TNA-weighted), active funds in our sample have an active share of 69% and passive funds have an active share of 16%.[15]

Table 1 and Fig. 1 provide the market share (as a percentage of TNA) of closet indexers and truly active funds across countries of domicile as of December 2010. We use

[13] Using the Lipper Technical Indicator Benchmark instead of the Fund Manager Benchmark (which is self declared by the fund), we avoid the concern that the fund strategically chooses its benchmark. In addition, the Fund Manager Benchmark is sparsely available, which reduces the sample size. However, in unreported analyses, we find similar results with the Fund Manager Benchmark in this smaller sample.

[14] The benchmark weights are calculated excluding synthetic ETFs that do not physically replicate the underlying benchmark index. In addition, for about 2% of the fund-year observations there are not at least five explicitly indexed funds tracking a particular benchmark. For these cases, we use as an alternative the aggregate portfolio of all active funds that track that benchmark.

[15] Explicitly indexed funds can have nonzero active shares if they do not engage in full physical index replication. For example, passive funds that track the S&P 500 index have an average active share of 4%.

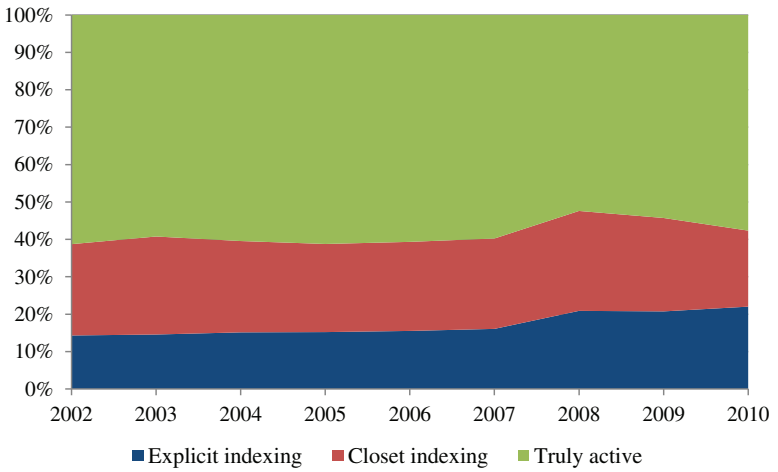


Fig. 2. Explicit and closet indexing by year. This figure shows the yearly percentage that explicitly indexed funds represent of the total net assets (TNA) (explicit indexing), the percentage that active funds with active share measure below 0.6 represent of the total TNA (closet indexing), and the percentage that active funds with active share measure above 0.6 represent of the total TNA (truly active). The sample includes open-end equity mutual funds from Lipper for which holdings are available in LionShares from 2002 to 2010.

an active share below 60% as the cutoff for an active fund to be classified as a closet indexer as in Cremers and Petajisto (2009). An active share of 60% means that 40% of the fund portfolio weights overlap with the benchmark index weights. The 60% cutoff is somewhat arbitrary, but as, on average, half the holdings (by asset weight) in any portfolio will beat the portfolio's average return, an active fund (with a manager who tries to beat the benchmark) should have an active share of at least 50%. In addition, the 60% threshold corresponds to classifying funds in the bottom tercile of the distribution of active share as closet indexers. All other funds with active shares equal to or above 60% are classified as truly active.

We find considerable variation in the extent of closet indexing across countries. In countries with little explicit indexing, the active funds are relatively passive. Although in Table 1 we report on active share for the final year in our sample, we find that the active share of funds is an extremely persistent fund attribute over time (the average serial correlation of active share at the fund level is 0.95). Table IA5 in the Internet Appendix reports the levels of explicit and closet indexing by country and benchmark type.[16] Fig. 2 shows the time series of the market shares of explicitly indexed funds, closet indexers, and truly active funds over 2002–2010.

3.3. Fees

We measure fees and expenses charged to mutual fund shareholders using the total expense ratio (TER) and loads. TER is broader than just management fees and includes all annual expenses that a fund charges its investors for investment management, administration, servicing, transfer agency, audit, and legal costs. Because TER excludes certain distribution fees, such as front-end or back-end loads, we calculate the average annual total shareholder costs (TSC), which is defined as TER plus one-fifth of the front-end load following Khorana, Servaes, and Tufano (2009). This calculation assumes that the typical investor holds a fund for five years and that back-end loads are waived if the fund is held for that length of time. If information on TER is not available (13% of the fund-year observations), we use instead the annual management fee, which constitutes a lower bound for the TER.[17]

The last three columns of Panels A and B in Table 1 report the (TNA-weighted) average TSC per country for each of the different fund types (explicitly indexed, closet indexers, and truly active) as of the end of 2010. Whether considering country of domicile or country of sale, the costs for explicitly indexed funds are lower than for active funds across all countries. In most countries of domicile, closet indexers are as costly as truly active funds, with an average TSC of 1.64% and 1.66% per year, respectively. Fig. 3 illustrates the range of the average TSC across the three types of funds for each country in our sample. These statistics confirm that explicitly indexed funds are a low-cost alternative to active funds worldwide but closet indexers charge fees at par with those of truly active funds.

4. Determinants of explicit and closet indexing across countries

Explicitly indexed funds provide a low-cost alternative for investors to get beta exposure, while closet indexers offer that same beta exposure but at higher fees. The evidence so far has shown wide variation in the range of fees

[16] We cannot differentiate between closet indexers that do not attempt to deviate from their benchmarks from those that ex ante commit resources to identify private information but ex post fail in identifying such opportunities. Observationally, these cases are equivalent, as both funds exhibit low active share measures.

[17] The TSC ignores annual fees charged by distributers as well as bid-ask spreads in the case of ETFs, which are typically narrow. For example, Morningstar (2012) reports that the Lyxor ETF Euro Stoxx 50 (the largest ETF on the Euro Stoxx 50 index) had a trailing 30-day average spread of 0.017% at the NYSE Euronext Paris.

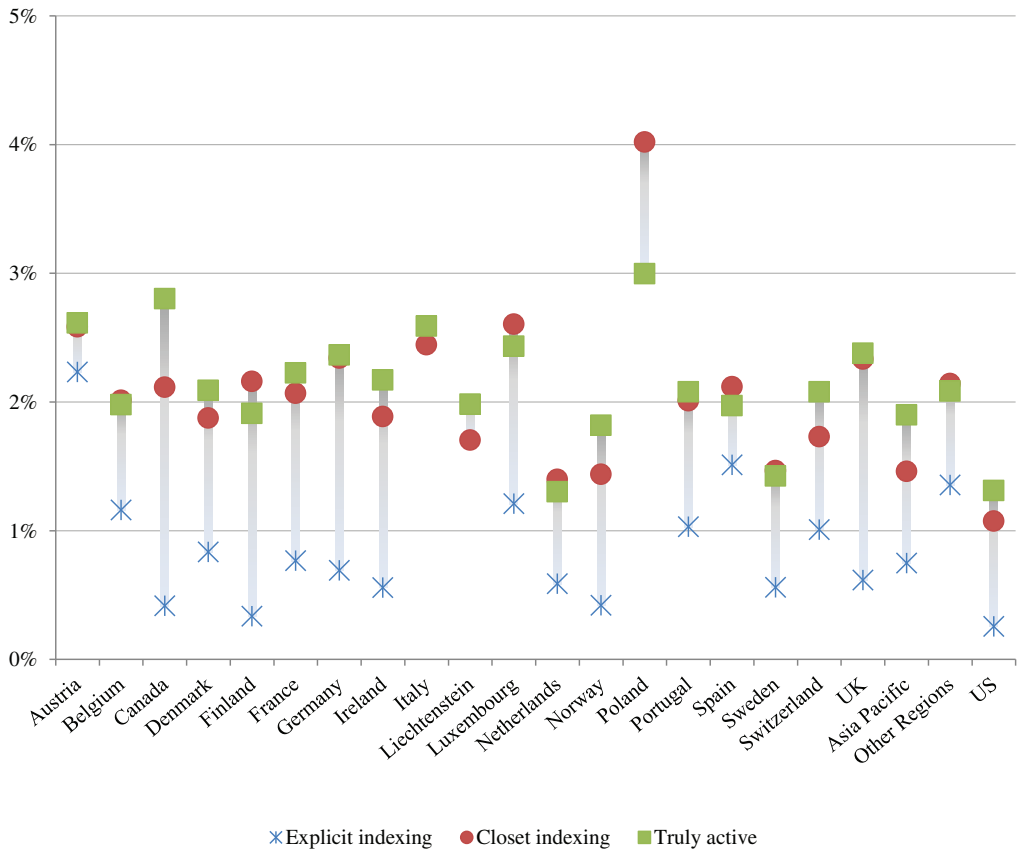


Fig 3. Average total shareholder cost by country of domicile. This figure shows the total net assets (TNA)-weighted average total shareholder cost of funds, defined as total expense ratio plus one-fifth of the front-end load, as of December 2010. The sample includes open-end equity mutual funds from Lipper for which holdings are available in LionShares. Explicit indexing includes index funds and exchange-traded funds. Closet indexing includes active funds with active share below 0.6. Truly active includes active funds with active share above 0.6.

across countries, suggesting that some degree of market segmentation exists. A major influence on market segmentation arises from the funds' location, i.e., the regulatory environment and conditions in the local fund industry. For example, Khorana, Servaes, and Tufano (2005, 2009) show that countries with stronger regulations and laws tend to have larger mutual fund industries, lower fund costs, and a higher spectrum of funds offered. These results suggest that if competition is driving the effects, then more low-cost explicitly indexed products (and fewer closet indexers) should be found in environments with stronger regulations and more developed fund industries.

Table 2 provides results on the determinants of explicit and closet indexing across countries over the sample period, in which we define the market alternatively by country of domicile (Panel A) and country of sale (Panel B). We use two measures of explicit indexing as dependent variables. *Explicit indexing* (*%TNA*) is the market share of explicitly indexed funds as a percentage of the TNA in each country in a given year. *Explicit indexing* (*average TSC*) is the TNA-weighted average total shareholder cost of explicitly indexed funds in each country in a given year. We also use a measure of the extent of closet indexing in a market, *Closet indexing* (*%TNA*), which is the market share of active funds with an active share below 60% as a percentage of the TNA in each country in a given year.

We examine the country-level determinants in separate regressions due to the limited number of country-year observations in our sample. In Columns 1, 3, and 5, we test whether indexing is related to regulatory factors (Khorana, Servaes, and Tufano, 2005): the extent to which regulatory approvals are required to set up a fund (*Approval*) and the quality of a country's judicial system (*Judicial*).[18] We find that a more restrictive regulatory approval regime for new funds is positively associated with the availability of explicit indexing. The economic impacts of *Approval* and *Judicial* are significant. For example, if one takes the estimates in Column 1 of Panel A, an increase in *Approval* from one to two is associated with an increase of about 6% in the market share of explicitly indexed funds. Given the relatively low market share of explicitly indexed funds across most countries, this is a large effect. Columns 3 and 5 show that *Judicial* is negatively associated with both the cost of index funds and the level of closet indexing in a country.

[18] *Approval* is the sum of two dummy variables: (1) whether regulatory approval is required to start a fund and (2) whether the prospectus requires regulatory approval. *Judicial* is the sum of five variables (all variables are scaled between 0 and 10): the efficiency of the judicial system, rule of law, corruption, risk of expropriation, and risk of contract repudiation.

Table 2
Determinants of explicit and closet indexing at country level.

This table presents estimates of yearly country-level regressions in which the dependent variable is the percentage that explicitly indexed funds represent of the total net assets (TNA) in a country [Explicit indexing (%TNA)], the TNA-weighted average total shareholder cost of explicitly indexed funds in a country [Explicit indexing (average TSC)], and the percentage that active funds with active share measure below 0.6 represent of the TNA in a country [Closet indexing (%TNA)]. The sample includes open-end equity mutual funds taken from Lipper for which holdings are available in LionShares from 2002 to 2010. In Panel A, the unit of observation is a country of domicile *j* in year *t*. In Panel B, the unit of observation is a country of sale *k* in year *t*. Regressions include year dummies. See Appendix A for variable definitions. Robust *t*-statistics are reported in parentheses. *, **, and *** reflect significance at the 10%, 5%, and 1% level, respectively.

Determinant	Explicit indexing (%TNA)		Explicit indexing (average TSC)		Closet indexing (%TNA)	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: By country of domicile						
Approval	0.0575**		0.1174		−0.0099	
	(2.51)		(1.54)		(−0.40)	
Judicial	0.0041**		−0.0245***		−0.0063***	
	(2.44)		(−4.27)		(−3.53)	
Fund industry size (log)		0.0298***		−0.0833***		−0.0330***
		(3.38)		(−2.77)		(−3.52)
Fund industry Herfindahl		0.8183***		0.1241		−0.0335
		(4.28)		(0.20)		(−0.16)
GDP per capita (log)		−0.0024		−0.0603		−0.0160
		(−0.17)		(−1.39)		(−1.09)
Number of observations	259	250	212	212	258	249
R-squared	0.066	0.104	0.110	0.125	0.156	0.205
Panel B: By country of sale						
	(1)	(2)	(3)	(4)	(5)	(6)
Approval	0.1098***		−0.0223		−0.0009	
	(4.69)		(−0.38)		(−0.06)	
Judicial	0.0051***		−0.0244***		−0.0045***	
	(2.87)		(−5.21)		(−4.17)	
Fund industry size (log)		0.0360***		−0.0922***		−0.0151***
		(4.14)		(−4.50)		(−2.88)
Fund industry Herfindahl		0.2874**		0.2181		−0.2013***
		(2.49)		(0.63)		(−2.89)
GDP per capita (log)		−0.0037		−0.1061***		−0.0123
		(−0.26)		(−3.26)		(−1.42)
Number of observations	254	254	240	240	254	254
R-squared	0.124	0.089	0.137	0.265	0.156	0.167

We also examine the characteristics of a country's fund industry (*Fund industry size, Fund industry Herfindahl*) and level of economic development (*GDP per capita*). Columns 2, 4 and 6 show that industry size is significantly related to the amount of indexing, both explicit and closet indexing. When the fund industry is larger, the higher is the market share of explicitly indexed funds, the lower is the cost, and the less widespread is closet indexing. These results are consistent with the argument that industry development and economies of scale make it easier for low-cost explicitly indexed products to be offered and, at the same time, for closet indexing by active funds to be mitigated. Our argument is that this mitigation is due to changes in the competitive environment caused by the increased presence of explicitly indexed funds.

We also run our regressions with all variables calculated by country of sale. The results reported in Panel B of Table 2 are consistent with those in Panel A.[19]

[19] In Table IA6 of the Internet Appendix, we show that results are robust when we further refine the analysis by measuring explicit and closet indexing separately by benchmark type (world, regional, country-domestic, and country-foreign) in each country.

5. Explicitly indexed funds and active funds

In this section, we study the relation between explicit indexing in a market and the product differentiation (active share) and price that investors pay for active management (total shareholder costs). For investors primarily interested in achieving exposure to beta, explicitly indexed funds are low-cost substitutes to the more expensive actively managed funds. If indexed funds create competitive pressure, then we expect active funds facing higher market penetration by indexed products to differentiate themselves by more actively deviating from their benchmarks through stock picking, sector bets, and market timing or by lowering their prices (fees). In alternative, actives funds' behavior might not be affected by indexed funds.

Previous research on mutual fund competition in the United States has arrived at diverse conclusions regarding whether index funds are commodities and should be selling for the same price (e.g., Elton, Gruber, and Busse, 2004; Hortacsu and Syverson, 2004; Collins, 2005). Researchers have also debated whether the US mutual fund industry as a whole is competitive (e.g., Coates and Hubbard, 2007; Gil-Bazo and Ruiz-Verdu, 2009; Wahal and Wang, 2011;

Table 3
Determinants of active management.

This table presents estimates of panel regressions in which the dependent variable is a fund's active share at year-end, defined as the percentage of a fund's portfolio holdings that differs from the fund's benchmark. The sample includes open-end active equity mutual funds taken from Lipper for which holdings are available in LionShares from 2002 to 2010. In Columns 1 and 2 the unit of observation is a fund's primary share class *i* domiciled in country *j* in year *t*. In Columns 3 and 4 the unit of observation is a fund share class *s* offered for sale in country *k* in year *t*. Regressions include year and benchmark dummies. See Appendix A for variable definitions. Robust *t*-statistics clustered by country of domicile-year (Columns 1 and 2) or country of sale-year (Columns 3 and 4) are reported in parentheses. *, **, and *** reflect significance at the 10%, 5%, and 1% level, respectively.

	By country of domicile		By country of sale	
	(1)	(2)	(3)	(4)
Explicit indexing (%TNA)	0.0075		0.0171**	
	(0.47)		(2.38)	
Explicit indexing (average TSC)		−0.0290***		−0.0128***
		(−4.90)		(−4.33)
Tracking error	1.6678***	1.6470***	1.6039***	1.6056***
	(7.47)	(7.16)	(14.09)	(13.81)
Total shareholder cost	0.0266***	0.0285***	0.0153***	0.0153***
	(15.43)	(15.71)	(21.00)	(20.52)
Total net assets (log)	−0.0057***	−0.0053***	0.0003**	0.0003**
	(−10.87)	(−10.16)	(2.37)	(2.38)
Family total net assets (log)	−0.0039***	−0.0044***	−0.0067***	−0.0068***
	(−5.06)	(−5.55)	(−18.84)	(−18.90)
Fund age	−0.0008***	−0.0008***	−0.0010***	−0.0010***
	(−5.55)	(−5.38)	(−8.93)	(−8.87)
Flows	0.0079***	0.0083***	0.0003***	0.0003***
	(6.69)	(7.05)	(8.19)	(8.22)
Benchmark-adjusted return	0.1414***	0.1386***	0.1645***	0.1643***
	(5.87)	(5.64)	(11.69)	(11.52)
International fund dummy	−0.0201***	−0.0166***	−0.0354***	−0.0349***
	(−4.02)	(−3.18)	(−5.18)	(−5.20)
Fund of fund dummy	0.0399***	0.0451***	0.0409***	0.0412***
	(4.58)	(5.01)	(7.97)	(8.02)
Off-shore fund dummy	0.0342***	0.0620***	0.0120***	0.0120***
	(2.86)	(4.26)	(6.31)	(6.35)
Approval	0.0087**	0.0151***	−0.0025**	−0.0026**
	(1.98)	(3.14)	(−2.05)	(−2.08)
Judicial	0.0026***	0.0024***	0.0006***	0.0004**
	(4.70)	(3.92)	(4.89)	(2.48)
Fund industry size (log)	0.0081***	0.0046**	0.0024***	0.0020***
	(5.20)	(2.50)	(3.74)	(3.23)
Fund industry Herfindahl	−0.2466***	−0.2122***	−0.0030	0.0106
	(−6.31)	(−6.00)	(−0.36)	(0.96)
GDP per capita (log)	−0.0352***	−0.0388***	−0.0152***	−0.0165***
	(−7.80)	(−8.56)	(−7.10)	(−6.73)
Number of observations	58,487	56,554	423,103	415,797
R-squared	0.622	0.623	0.617	0.616

Khorana and Servaes, 2012). Our hypotheses focus on the effects of the entry of low-cost passive investment vehicles on the fund industry competitive environment in changes to active funds' product differentiation and fees.

5.1. Product differentiation

To test our hypothesis on product differentiation, we estimate panel regressions using the sample of active equity funds. The dependent variable is the yearly fund-level active share, and the main explanatory variables are the market share and TNA-weighted average total shareholder costs of explicitly indexed funds located in the same country as the fund. We control for fund characteristics, dummies for particular types of funds (international, fund of fund, off-shore), country characteristics, and year dummies, and we cluster standard errors by country-year.[20] The regressions also include fund benchmark dummies, which control for any unobserved (time invariant) heterogeneity in portfolio management across different benchmarks.

Table 3 presents the results. Columns 1 and 2 show the results when we measure the indexing variables by country of domicile. Columns 3 and 4 show the results using the individual share class offered for sale in a given country and year as a unit of observation, and we

[20] We obtain similar estimates when we use two-way cluster standard errors by country and by year.

measure indexing variables (and other country variables) by country of sale and year.[21]

In Columns 1 and 3 we examine the relation between product differentiation by active funds and the relative prominence of explicitly indexed funds. Although in the analysis using country of domicile we do not find this relation to be significant, in the country of sale analysis shown in Column 3 we find that active funds tend to have higher active shares in countries in which explicitly indexed funds have higher market share. Further consistent with our hypothesis, Columns 2 and 4 show that the coefficient on the average TSC of explicitly indexed funds is negative and significant. These results suggest that funds tend to engage in more active management in markets in which they face more competitive pressure from explicitly indexed funds. The effects are economically meaningful, as we find that a one standard deviation increase in the average TSC of passive funds (0.53) in a country is associated with a decrease in average active share of 1.5 percentage points using the estimate in Column 2.

Overall, the tests in Table 3 are consistent with the hypothesis that active fund managers perceive low-cost explicitly indexed funds as a competitive threat. These results provide additional insights into the organization of mutual fund markets. For example, we find that funds are more active in larger fund markets and countries with higher judicial quality. Further, active shares are higher for funds with higher tracking error (i.e., volatility of the difference between a portfolio return and its benchmark index return), higher TSC, younger funds, and those affiliated with smaller fund families. Moreover, we find that fund managers who have been more successful in the past (in terms of performance and attracting flows) have higher active shares. These results for our international sample of mutual funds are in line with those in Cremers and Petajisto (2009) for US equity mutual funds.

The active share regression results in Table 3 are robust to a number of specification checks. In Table IA7 of the Internet Appendix we estimate the regression using the sample of non-US funds to alleviate any concerns that results are driven by the fact that funds domiciled in the United States represent a large fraction of the observations. We also consider alternative methods to estimate a fund's active share. In particular, we calculate the proportion of a fund's portfolio holdings that differ from the aggregate stock portfolio of active funds that track a fund's benchmark, in the spirit of the overlap measure of Wahal and Wang (2011).[22] In addition, we estimate the regression model using weighted least squares, in which the total net assets of the fund are employed as the weights and estimate regressions using country fixed effects. Finally, we measure the indexing variables for each country and benchmark type, and we consider only the sample of domestic funds.

If fund managers react to the competitive threat of explicitly indexed funds by increasing their active share, then an implication is that they expect higher fund flows from such actions. We test this implication by examining whether mutual funds that offer more distinct portfolios (as proxied by higher active share) attract greater flows. We measure net flows at the annual frequency as the net growth in total net assets, following the method in Sirri and Tufano (1998). We estimate regression of net flows on prior year active share and fund-level control variables shown in previous research to be related to flows such as prior year TNA, age, TSC, and tracking error (e.g., Sirri and Tufano, 1998; Del Guercio and Tkac, 2002). The regressions also include year and benchmark dummies, and standard errors are clustered by country-year.

The relation between flows and active share is likely to be influenced by a fund's past performance. Thus, we include an interaction term between active share and the return quintile ranking of the fund. Following Sirri and Tufano (1998) and Wahal and Wang (2011), the return rank variable is defined as zero for funds in the bottom quintile of performance (over the prior 12 months), one for funds in the middle 60%, and two for funds in the top 20%. The return quintile rankings rely on benchmark-adjusted returns (Columns 1 and 3) or benchmark-adjusted four factor alphas (Columns 2 and 4) as measures of fund performance. The benchmark-adjusted return is the difference between the fund's net return and the return on its benchmark (see Section 6 for details on performance measures). Funds are sorted within each country-benchmark segment to determine the rankings.

Table 4 presents the estimates of these regressions. Columns 1 and 2 show the estimates by country of domicile; Columns 3 and 4, by country of sale. We find that funds with higher active share attract more flows and the effect is even more pronounced among funds that rank high in the performance rankings. The effects are both statistically and economically significant. For example, for a fund in the bottom quintile of performance, the coefficient in Column 2 implies that a one standard deviation increase in active share is associated with 2.7% higher flows. The results are robust to changing the performance measure and to whether the unit of observation is defined by country of domicile or country of sale.

5.2. Total shareholder costs

We next test the hypothesis that actively managed fund managers tend to charge (or not) lower fees when they face more competition from (low-cost) explicitly indexed funds. To test this hypothesis, we estimate panel

[21] This setup takes into account that a fund can be offered for sale in multiple countries. A fund with two share classes, each offered for sale in three countries, has six different observations per year in this sample. In these tests, fund-level variables are measured at the individual share class level, and country-level variables are measured by the country of sale. The indexing variables (market share and cost of explicitly indexed funds and the market share of closet indexers) are measured by country of sale.

[22] We also use two alternative methods to calculate active share. (1) We construct the index weights based only on ETFs that engage in full physical replication of the indices (SPDR or iShares ETFs). (2) We assign benchmarks ourselves, taking the most representative benchmark every year for a fund, based on the one against which it has the lowest active share. More details are provided in the Internet Appendix.

Table 4
Fund flows and active management.

This table presents estimates of panel regressions where the dependent variable is a fund's yearly net flows, defined as new external money growth as percentage of total net assets (TNA). Return rank is equal to zero for funds in the bottom 20% of performance (benchmark-adjusted return or four-factor alpha over the prior 12 months), one for funds in the middle 60%, and two for funds in the top 20%. The sample includes open-end active equity mutual funds taken from Lipper for which holdings are available in LionShares from 2002 to 2010. In Columns 1 and 2 the unit of observation is a fund's primary share class *i* domiciled in country *j* in year *t*. In Columns 3 and 4 the unit of observation is a fund share class *s* offered for sale in country *k* in year *t*. Regressions include year and benchmark dummies. See Appendix A for variable definitions. Robust *t*-statistics clustered by country of domicile-year (Columns 1 and 2) or country of sale-year (Columns 3 and 4) are reported in parentheses. *, **, and *** reflect significance at the 10%, 5%, and 1% level, respectively.

	By country of domicile		By country of sale	
	Benchmark-adjusted return	Benchmark-adjusted four-factor alpha	Benchmark-adjusted return	Benchmark-adjusted four-factor alpha
	(1)	(2)	(3)	(4)
Active share	0.0865*	0.1218***	0.3782***	0.3648***
	(1.89)	(2.82)	(11.91)	(11.95)
Return rank	0.0250	0.0224	0.0695***	0.0211**
	(1.20)	(1.23)	(4.91)	(1.97)
Active share × return rank	0.1408***	0.1166***	0.1349***	0.1500***
	(4.17)	(4.21)	(6.68)	(8.76)
Tracking error	0.1573	0.1462*	0.6609***	0.5904***
	(1.55)	(1.70)	(4.67)	(4.85)
Total shareholder cost	−0.0256***	−0.0254***	−0.0506***	−0.0520***
	(−4.07)	(−3.97)	(−10.33)	(−9.93)
Total net assets (log)	−0.0804***	−0.0764***	−0.1199***	−0.1146***
	(−14.54)	(−14.38)	(−23.95)	(−23.68)
Family total net assets (log)	0.0250***	0.0238***	0.0597***	0.0581***
	(6.69)	(6.27)	(15.16)	(14.80)
Fund age	−0.0030***	−0.0024***	−0.0056***	−0.0032***
	(−7.78)	(−6.03)	(−15.03)	(−9.44)
International fund dummy	0.0176	0.0203	0.0573***	0.0675***
	(0.84)	(0.95)	(2.70)	(3.13)
Fund of fund dummy	−0.0749***	−0.0677***	−0.0953***	−0.0891***
	(−3.00)	(−2.67)	(−4.52)	(−4.10)
Off shore fund dummy	−0.2038***	−0.1963***	0.0096	0.0006
	(−3.55)	(−3.37)	(1.19)	(0.07)
Approval	−0.0235	−0.0193	0.0004	0.0015
	(−1.24)	(−1.01)	(0.08)	(0.30)
Judicial	−0.0091***	−0.0088***	0.0001	−0.0000
	(−3.14)	(−2.99)	(0.18)	(−0.09)
Fund industry size (log)	0.0167**	0.0164**	−0.0109***	−0.0102***
	(2.05)	(1.98)	(−4.02)	(−3.77)
Fund industry Herfindahl	−0.0585	−0.0564	−0.0177	−0.0026
	(−0.33)	(−0.31)	(−0.41)	(−0.06)
GDP per capita (log)	0.1166***	0.1131***	0.0279***	0.0263**
	(5.05)	(4.82)	(2.61)	(2.55)
Number of observations	52,767	52,767	375,494	375,494
R-squared	0.083	0.079	0.099	0.093

regressions of yearly fund-level total shareholder costs using the sample of active funds. The main explanatory variables are the country-level prevalence and average cost of explicit indexing in the country in which the fund is domiciled or offered for sale. We include fund-level active share as a determinant of the TSC, as well as the same fund and country characteristics used in Table 3. Regressions also include year and fund benchmark dummies and standard errors are clustered by country-year.

Table 5 presents the results by country of domicile in Columns 1–3 and by country of sale in Columns 4–6. We find that the TSC charged by active funds are higher in countries in which explicitly indexed funds have less market share and are more expensive. The effect of the market share of explicitly indexed funds is statistically significant only when the indexing variable is defined by country of sale (Column 4). The effect of the cost of explicitly indexed funds is statistically significant in both Columns 2 and 5. The estimates in Column 2 show that a decline in the average TSC of indexed funds of 50 basis points (the difference in TSC between US and non-US funds) is associated with 16 basis point lower fees charged by active funds. Overall, the results suggest that investors pay a higher price for active funds in markets in which explicitly indexed products exert less competitive pressure.

Columns 3 and 6 of Table 5 show that active fund fees are higher in markets in which closet indexing is more pervasive. According to estimates in Column 3, an increase in the level of closet indexing of 15 percentage points (the difference between the United States and the rest of the world) is associated with an increase in the funds' TSC of about 4 basis points. This indicates that closet indexing reflects a less competitive fund industry in which funds extract higher fees.

Table 5
Determinants of the total shareholder costs of active funds.

This table presents estimates of panel regressions in which the dependent variable is a fund's yearly total shareholder cost, defined as total expense ratio plus one-fifth of the front-end load. The sample includes open-end active equity mutual funds taken from Lipper for which holdings are available in LionShares from 2002 to 2010. In Columns 1–3 the unit of observation is a fund's primary share class *i* domiciled in country *j* in year *t*. In Columns 4–6 the unit of observation is a fund share class *s* offered for sale in country *k* in year *t*. Regressions include year and benchmark dummies. See Appendix A for variable definitions. Robust *t*-statistics clustered by country of domicile-year (Columns 1–3) or country of sale-year (Columns 4–6) are reported in parentheses. *, **, and *** reflect significance at the 10%, 5%, and 1% level, respectively.

	By country of domicile			By country of sale		
	(1)	(2)	(3)	(4)	(5)	(6)
Explicit indexing (%TNA)	−0.0444			−0.4118***		
	(−0.36)			(−4.18)		
Explicit indexing (average TSC)		0.3275***			0.1239***	
		(7.44)			(5.84)	
Closet indexing (%TNA)			0.2863**			0.3035**
			(2.44)			(2.29)
Active share	0.6080***	0.6382***	0.6192***	0.5867***	0.5857***	0.5892***
	(13.96)	(14.29)	(13.93)	(23.96)	(23.56)	(23.57)
Tracking error	0.9326***	1.0024***	0.9722***	1.3308***	1.3261***	1.3402***
	(6.31)	(6.61)	(6.59)	(9.87)	(10.07)	(10.35)
Total net assets (log)	−0.0719***	−0.0752***	−0.0718***	−0.0324***	−0.0327***	−0.0325***
	(−20.27)	(−22.74)	(−20.53)	(−18.01)	(−17.83)	(−17.78)
Family total net assets (log)	0.0146***	0.0176***	0.0146***	−0.0106***	−0.0098***	−0.0096***
	(2.82)	(3.40)	(2.87)	(−5.06)	(−4.62)	(−4.64)
Fund age	0.0058***	0.0052***	0.0057***	0.0131***	0.0130***	0.0131***
	(6.89)	(6.30)	(6.80)	(13.18)	(12.99)	(13.02)
Flows	0.0055	0.0032	0.0044	−0.0019***	−0.0019***	−0.0019***
	(0.90)	(0.52)	(0.72)	(−6.59)	(−6.51)	(−6.51)
Benchmark-adjusted return	−0.2542***	−0.2173***	−0.2480***	−0.5942***	−0.5896***	−0.5969***
	(−4.04)	(−3.55)	(−3.97)	(−14.02)	(−13.87)	(−14.09)
International fund dummy	0.3634***	0.2973***	0.3359***	0.5105***	0.5256***	0.5258***
	(14.99)	(10.13)	(13.60)	(17.25)	(19.34)	(16.68)
Fund of fund dummy	−0.2490***	−0.2402***	−0.2546***	−0.3911***	−0.3934***	−0.3912***
	(−6.90)	(−6.78)	(−7.04)	(−13.99)	(−13.89)	(−13.98)
Off-shore fund dummy	−0.0404	−0.3208***	−0.0319	0.2604***	0.2611***	0.2620***
	(−0.43)	(−3.09)	(−0.36)	(22.04)	(21.67)	(22.07)
Approval	−0.3734***	−0.4667***	−0.3727***	−0.0010	−0.0046	−0.0056
	(−8.55)	(−11.81)	(−8.63)	(−0.11)	(−0.51)	(−0.61)
Judicial	−0.0088	−0.0037	−0.0082	−0.0010	0.0006	−0.0016**
	(−1.59)	(−0.68)	(−1.50)	(−1.16)	(0.49)	(−2.05)
Fund industry size (log)	−0.0537***	0.0027	−0.0494***	−0.0270***	−0.0254***	−0.0297***
	(−3.39)	(0.16)	(−2.96)	(−5.59)	(−5.29)	(−6.05)
Fund industry Herfindahl	−1.5938***	−1.6571***	−1.6930***	−0.0375	−0.1661	0.0310
	(−4.27)	(−4.27)	(−4.58)	(−0.40)	(−1.18)	(0.32)
GDP per capita (log)	0.0962**	0.1348***	0.1140***	0.0500***	0.0549***	0.0469***
	(2.24)	(3.14)	(2.73)	(2.80)	(2.65)	(2.61)
Number of observations	58,487	56,554	58,487	423,103	415,797	423,103
R-squared	0.390	0.393	0.391	0.198	0.199	0.198

We also find that fund characteristics matter for a fund's total shareholder costs. Higher active share, higher tracking error, and smaller and older funds are associated with greater fees. Consistent with the evidence in Khorana, Servaes, and Tufano (2009), fees are lower in stronger regulatory environments and when fund industries are larger.[23]

[23] We subject these TSC regressions to a number of robustness checks. In Table IA8 of the Internet Appendix we consider the sample of non-US funds, as well as alternative measures of active share, weighted least squares, country fixed effect, analysis by country-benchmark type, and restricting the sample to domestic funds. We conclude that the total shareholder cost regression results are robust to these checks.

5.3. Endogeneity

A potential concern with our findings is endogeneity; that is, the active share and fees charged by active funds are likely jointly determined with the market share and cost of explicitly indexed funds (and closet indexers). So far, we have used funds' benchmarks or country fixed effects to address the concern that the availability of explicit indexing could be related to some unobserved (time invariant) benchmark or country characteristic that explains the active share and fees of active funds.

In this subsection, we consider a quasi-natural experiment to identify the causal effects of indexed funds on the behavior of active funds. We explore the exogenous variation in competitive pressure from explicitly indexed funds that results from the staggered passage of pension

legislation in a fund's country. We argue that the shift observed in many countries towards a defined contribution pension system has contributed to the rise of index funds and ETFs. In fact, the Pension Acts generally include policy changes designed to increase market competition such as providing investors easy access to low-cost funds. One example is in the United Kingdom, which allowed workers to opt out of the occupational pension plan of their employers and created the National Employment Savings Trust (NEST). According to *The Economist* (2014), "As part of a plan to nudge people into taking out private pensions, known as auto-enrolment, the British government set up a collective scheme called NEST, with annual fees that equate to just 0.5%. Such measures make it likely that more investments will flow into tracker funds."

The key assumption of our identification strategy is that pension reforms are not related to the conditions of the mutual fund industry in each country, other than through changes in the availability of explicitly indexed funds. For example, these Pension Acts help us to avoid the endogeneity problem to the extent that their timing is a result of the legislative agenda in the various countries, not driven by particular countries' fund industry conditions. According to the Organisation for Economic Co-operation and Development (2011) (OECD), population aging and the fiscal sustainability of public systems have been the main driving forces behind pension reforms. For the last two decades, the pension framework has changed from mostly defined benefit plans (either public retirement or employer-provided private pension plans) to private defined contribution plans, in which the investment and longevity risk are borne by plan participants instead of governments or employers.

Media coverage at the times of the legislative changes illustrates this. For example, shortly before the 2001 legislative change in Japan, the Economist Intelligence Unit discussed the size of the Japanese pension market, the country's aging trend, and the government's plans for reform to solve these problems: "As part of a long-term solution, the government plans to introduce a defined-contribution pension scheme that would pay benefits based on investment returns."[24] Similarly, the discussion in the press about Norway's reforms focused on the changing demographics and the need for change: "Norway's Parliament is set to vote on legislation aimed at securing the future of the pension system during a time of demographic change. At its core, the bill transfers part of the cost of pensions from the state system to employers" (Wall Street Journal, 2005).

We collect the year of the passage of the Pension Act for each country from the Organisation for Economic Co-operation and Development (2009). Table IA2 in the Internet Appendix provides the year of the Pension Act passage in each country. (In the instances in which there are multiple dates of passage of Pension Act legislation in a country, we choose the earliest date.) We restrict the sample to countries that passed the Pension Act in the 1990s or 2000s. We first check whether the passage of a Pension Act in a country appears to be associated with increased competition for active funds due to changes to the market share and cost of explicitly indexed funds. Panels A and B of Fig. 4 display the evolution of the market share and the average TSC of explicitly indexed funds, respectively, around the passage of the Pension Act (between year -1 and year 0) for the treatment group (i.e., countries that passed a Pension Act in year t) and the control group (i.e., countries that did not pass a Pension Act in year t). The market share of explicitly indexed funds in the treatment group increases from 5.5% three years prior to the event to about 9% three years after the event. In parallel, the average TSC of explicitly indexed funds in the treatment group decreases from about 1% three years before the event to about 0.85% three years after the event. In contrast, the market share and average TSC of indexed funds in a country that did not pass a Pension Act in that year do not show significant changes in the year of the Pension Act passage. These findings suggest that Pension Act legislation is associated with increased availability of low-cost passive investment alternatives.

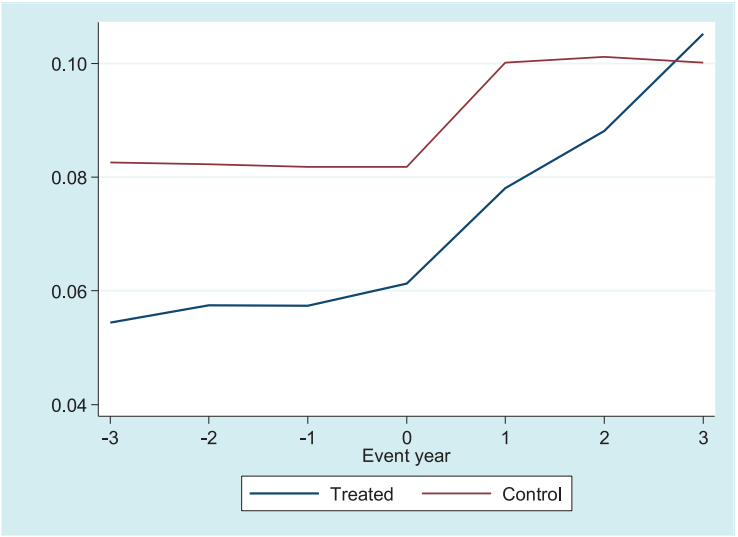
We next examine the corresponding response of actively managed funds by comparing the outcomes in each country that passed a Pension Act in the years before versus the years after passage. We use the group of countries without pension legislative changes over that year to control for changes in fund industry conditions in a regression framework. As a result, we compare the differences in outcome variables in the treatment group of countries before and after the year of the Pension Act passage with the differences in those variables for the control group of countries over the same period. These differences in differences provide estimates of how the passage of Pension Acts affected the decisions of the active funds located in the country. The regression accounts for the fact that there are many Pension Acts staggered over time. Because the regression implicitly takes all countries not passing a Pension Act at time t as a control group, even if they already passed a Pension Act or would pass one later on, it accounts for the fact that the passage of the Pension Acts is staggered over time. The regressions also include year dummies to control for aggregate changes in stock markets and the fund industry.

Table 6 reports the estimates from the differences-in-differences regressions in which the dependent variables are the active share (Columns 1–3) and total shareholder cost (Columns 4–6) of active funds. Again we report two sets of results. Panel A reports estimates by country of domicile, and Panel B reports estimates by country of sale. The explanatory variable of interest is the *Post-Pension Act* ($year \geq 0$), a dummy variable that takes the value of one if a Pension Act has been passed in the fund's country by year t. Thus, the coefficient on the *Post Pension Act* ($year \geq 0$) variable estimates the impact of the Pension Act on the active share and TSC. The regression controls for time invariant differences between funds in the treatment versus the control groups through fund fixed effects.

Column 1 in Panels A and B report the estimated impact of the passage of a Pension Act on the active share of active funds in that country. On average, in the years after the act is passed, funds increase their active shares by 1.3%

[24] See Economist Intelligence Unit (1999).

Panel A: Explicit indexing (% TNA)



Panel B: Explicit indexing (average TSC)

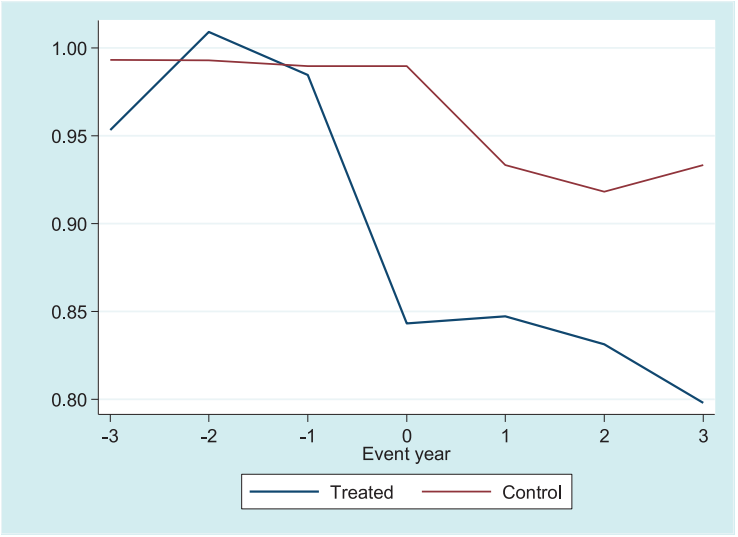


Fig. 4. Explicit indexing around passage of the Pension Act. This figure shows the percentage that explicitly indexed funds represent of the country's fund industry total net assets (TNA) (Panel A) and the average total shareholder costs of explicitly indexed funds (Panel B) for the treated group (countries that passed a Pension Act in year t) and the control group around passage of a Pension Act (between year -1 and year 0) in the funds' country of sale. Explicit indexing includes index funds and exchange-traded funds. The sample includes open-end equity mutual funds from Lipper for which holdings are available in LionShares.

for the country of domicile analysis in Panel A and 1.5–2% for the country of sale analysis in Panel B. The coefficients are statistically significant. In Column 2 in both panels, the active share effect of the acts remains robust to the inclusion of time-varying fund controls such as TNA, age, and flows.

In Column 3, we provide further evidence regarding the potential issues of reverse causality and industry-level confounding effects and to what extent any preexisting trends are present in the years before the Pension Acts were passed. We replace the *Post-Pension Act* dummy variable with four dummy variables: *Pre-Pension Act* ($-3 \leq year \leq -1$) is a dummy variable that equals one if a fund's country passes a Pension Act in three years, two years or one year; *Post-Pension Act* (*year* 0) is a dummy variable that equals one if a fund's country passes a Pension Act in the current year; *Post-Pension Act* (*year* 1) is a dummy variable that equals one if a fund's country passed a Pension Act in the previous year; and *Post-Pension Act* ($year \geq 2$) is a dummy variable that equals one if a fund's country passed a Pension Act two years ago or more. The variable *Pre-Pension Act* ($-3 \leq year \leq -1$) allows us to evaluate whether an effect on funds' active shares can be found prior to the passage of the Pension Act, which could indi-

Table 6
Differences-in-differences estimates using the passage of Pension Acts.

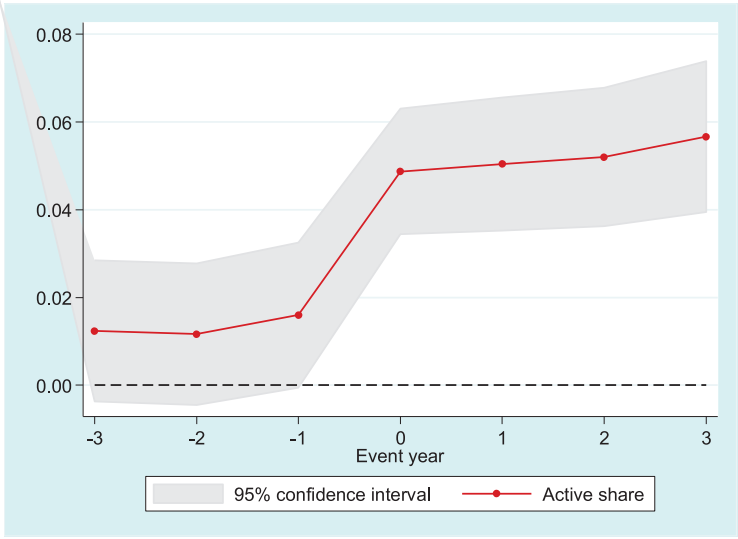
This table presents differences-in-differences estimates where the dependent variable is the fund's active share at year-end (Columns 1–3), yearly total shareholder cost (Columns 4–6), and the fund industry Herfindahl at year-end (Column 7). Active share is the percentage of a fund's portfolio holdings that differs from the fund's benchmark. Total shareholder cost is total expense ratio plus one-fifth of the front-end load. The sample includes open-end active equity mutual funds taken from Lipper for which holdings are available in LionShares from 2002 to 2010. In Panel A the unit of observation is a fund's primary share class *i* domiciled in country *j* in year *t*. In Panel B the unit of observation is a fund share class *s* offered for sale in country *k* in year *t*. Post-Pension Act (year ≥ 0) is a dummy variable that equals one if a fund's country has passed a Pension Act that year or earlier. Pre-Pension Act (year -3) is a dummy variable that equals one if a fund's country passes a Pension Act in three years, two years or one year. Post-Pension Act (year 0) is a dummy variable that equals one if a fund's country passes a Pension Act in the current year. Post-Pension Act (year 1+) is a dummy variable that equals one if a fund's country passed a Pension Act one year ago. Post-Pension Act (year 2+) is a dummy variable that equals one if a fund's country passed a Pension Act two years ago or more. Regressions include year and fund fixed effects. See Appendix A for variable definitions. Robust *t*-statistics clustered by country of domicile-year (Panel A) or country of sale-year (Panel B) are reported in parentheses. *, **, and *** reflect significance at the 10%, 5%, and 1% level, respectively.

	Active share			Total shareholder cost			Fund industry Herfindahl
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: By country of domicile							
Post-Pension Act (year ≥ 0)	0.0132*	0.0122*		−0.0519**	−0.0361**		
	(1.83)	(1.86)		(−1.98)	(−2.09)		
Pre-Pension Act (−3 ≤ year ≤ −1)			0.0143			−0.0272	−0.0193
			(1.22)			(−1.12)	(−1.35)
Post-Pension Act (year 0)			0.0241***			−0.0484**	−0.0172
			(2.79)			(−2.06)	(−1.14)
Post-Pension Act (year 1)			0.0258***			−0.0623**	−0.0152
			(3.10)			(−2.48)	(−0.96)
Post-Pension Act (year ≥ 2)			0.0305***			−0.0692***	−0.0096
			(3.38)			(−2.74)	(−0.58)
Total net assets (log)		−0.0128***	−0.0128***		−0.0374***	−0.0374***	0.0018***
		(−6.55)	(−6.53)		(−6.48)	(−6.45)	(2.64)
Family total net assets (log)		−0.0004	−0.0011		−0.0235**	−0.0224**	−0.0038**
		(−0.14)	(−0.38)		(−2.37)	(−2.22)	(−2.09)
Fund age		0.0080***	0.0074***		0.0149***	0.0150***	−0.0028**
		(7.70)	(6.56)		(5.42)	(4.67)	(−2.31)
Flows		0.0063***	0.0062***		0.0178***	0.0178***	−0.0002
		(4.95)	(4.84)		(3.92)	(3.87)	(−0.72)
Number of observations	30,116	26,638	26,638	30,101	26,630	26,630	26,638
R-squared	0.906	0.909	0.909	0.939	0.946	0.946	0.973
Panel B: By country of sale							
Post Pension Act	0.0197***	0.0154***		−0.0471**	−0.0311**		
	(4.09)	(4.13)		(−2.50)	(−2.09)		
Pre Pension Act (−3 ≤ year ≤ −1)			0.0159			−0.0201	−0.0158
			(1.08)			(−1.25)	(−1.42)
Pension Act (year 0)			0.0392***			−0.1131***	−0.0167
			(5.56)			(−5.90)	(−1.26)
Post Pension Act (year 1)			0.0411***			−0.1209***	−0.0201
			(5.66)			(−6.26)	(−1.51)
Post Pension Act (year ≥ 2)			0.0449***			−0.0951***	−0.0162
			(5.83)			(−4.26)	(−1.19)
Total net assets (log)		−0.0137***	−0.0136***		−0.0316***	−0.0316***	−0.0003
		(−8.54)	(−8.48)		(−6.60)	(−6.53)	(−0.29)
Family total net assets (log)		0.0002	−0.0011		−0.0311***	−0.0275***	0.0005
		(0.08)	(−0.53)		(−5.04)	(−4.30)	(0.15)
Fund age		0.0075***	0.0069***		0.0196***	0.0189***	−0.0025
		(10.91)	(8.67)		(7.86)	(6.61)	(−1.23)
Flows		0.0071***	0.0069***		0.0198***	0.0195***	−0.0004
		(9.38)	(9.10)		(7.32)	(6.97)	(−0.56)
Number of observations	62,155	56,320	56,320	62,132	56,306	56,306	56,320
R-squared	0.911	0.915	0.915	0.938	0.945	0.945	0.490

cate some reverse causality. We find that the coefficient on *Pre-Pension Act* (−3 ≤ *year* ≤ −1) is statistically insignificant, while we find that the coefficients on *Post-Pension Act* (*year* 0) and *Post-Pension Act* (*year* 1) and *Post-Pension Act* (*year* ≥ 2) are positive and significant. Further, the *Post-Pension Act* (*year* 1) and *Post-Pension Act* (*year* ≥ 2) coefficients are economically larger than that on *Pension Act* (*year* 0), which is consistent with a causal interpretation of the effect of the passage of the Pension Act on active share.

Columns 4–6 in Panels A and B present estimates of similar specifications for the TSC of active funds by country of domicile and sale. In both cases, subsequent to the act

Panel A: Active share



Panel B: Total shareholder cost

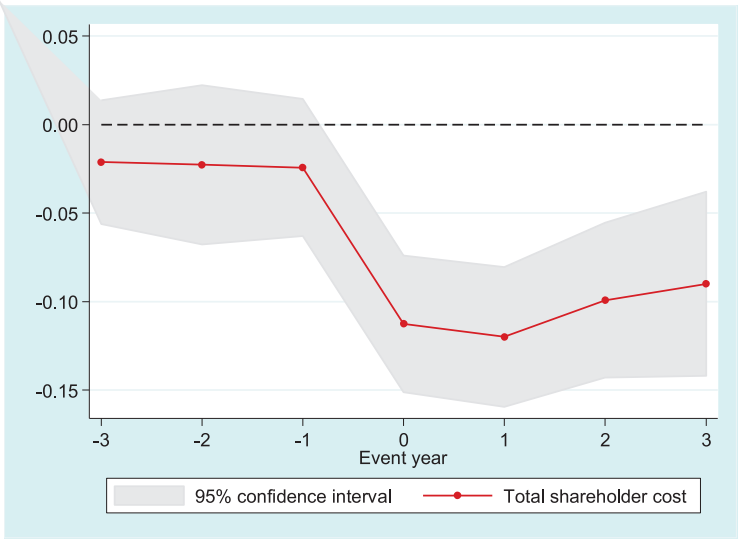


Fig. 5. Active management around passage of the Pension Act. This figure shows point estimates and 95% confidence intervals for the effect on the average active share (Panel A) and average total shareholder cost (Panel D) of active funds in the treated group (countries that passed a Pension Act in year t) relative to the control group around the country's passage of a Pension Act (between year -1 and year 0) in the funds' country of sale. The sample includes open-end equity mutual funds from Lipper for which holdings are available in LionShares.

being passed, the active funds reduce the TSC by 3 to 5 basis points, reductions that are statistically significant at the 5% level. Further, the coefficient on *Pre-Pension Act* ($-3 \leq$ *year* ≤ -1) is statistically insignificant, and the coefficients on *Post-Pension Act* (*year* 1) and *Post-Pension Act* (*year* $\geq$ 2) are economically larger than that on *Pension Act* (*year* 0). These results are consistent with Pension Acts having causal effects on shareholder costs, and they rule out the existence of pre-trends.

Given the concern that pre-trends could exist in the outcome variables (active share and TSC of active funds) for the treatment group relative to the control group, Fig. 5 plots the coefficients on these variables equivalent to those in Columns 3 and 6 in Table 6, Panel B, but including yearly leads and lags of the *Post-Pension Act* dummy variable. Panel A presents estimates in which the dependent variable is the active share, and Panel B presents estimates in which the dependent variable is the TSC of active funds. Both panels show no differentials in the trends between the treated and control groups prior to the Pension Act passages, but sharp differences emerge after the Pension Act legislation.

We conduct other sensitivity tests of our differences-in-differences estimates. First, we report the results of tests of changes in fund industry conditions (industry concentration) that could correlate with the outcome variables in Column 7 of Panels A and B. These results show no statistically significant differences in the periods before and after the passage of the Pension Acts. Second, we perform placebo tests using countries that have not approved a Pension Act as a fictitious treatment group and randomly assigning them years in which a Pension Act was approved (i.e., a year between 2002 and 2007). The results show no statistical significant effects in the outcomes variables. Finally, we implement an instrumental variables approach as another way to address the potential endogeneity in our original tests, using the financial sophistication of retail investors in a country and the development of the DC pension market as instruments. The results in Tables IA9 and IA10 of the Internet Appendix are consistent with those in Tables 3 and 5. Overall, the results of all these sensitivity tests support the interpretation of a causal effect of explicitly indexed funds on active funds.

6. Returns to active management

In this section, we test whether investors benefit from the changing fund industry dynamics. That is, we examine whether performance from investing in truly active funds improves as competition from explicit index funds increases. We first examine benchmark-adjusted returns (i.e., the difference between the fund's net return and the return on its benchmark). The average benchmark-adjusted net return for all active funds in our sample is approximately zero, consistent with results in other studies of mutual fund performance and also consistent with the Berk and Green (2004) theory of active fund management. We find that truly active funds significantly outperform closet indexers. Further, we find that the truly active funds are able to outperform their benchmarks on average by 1.04% per year (0.12% if equal-weighting).

We next examine whether active share predicts future fund performance using benchmark-adjusted four-factor alphas as our measure of performance. The four-factor alphas are estimated using three years of past monthly fund (benchmark-adjusted) returns with regional factors (Asia, Europe, North America, and emerging markets) or world factors in the case of world funds in the manner of Bekaert, Hodrick, and Zhang (2009). Ferreira, Keswani, Miguel, and Ramos (2013) provide details on the construction of the factors. We then subtract the expected return from the realized fund return to estimate the fund abnormal return (alpha) in each year, which is measured as the sum of the intercept of the model and the residual as in Carhart (1997). We then regress four-factor alphas on active share and fund and country characteristics in pooled regressions. All independent variables are measured with a one-year lag. The regressions also include benchmark and year dummies, and standard errors are clustered by country-year.

Table 7 reports the results. Panel A reports estimates when indexing variables and other country variables are measured by country of domicile, and Panel B reports estimates when these variables are measured by country of sale and the unit of observation is a fund share class offered for sale in each country. Column 1 shows that funds with higher active share perform better. Thus, active share is a predictor of future fund performance across world markets, consistent with the Cremers and Petajisto (2009) results for US equity mutual funds. The effect of active share on future fund performance is both statistically and economically significant. A one standard deviation increase in active share is associated with a 0.7% increase in four-factor alphas in the subsequent year using the estimate in Column 1, Panel A.

Table 7 also shows that tracking error (an alternative measure of active management) is negatively related to future fund performance. This suggests that the market rewards funds that are most active in stock picking (which is captured by active share) but does not reward factor bets (which is captured by tracking error). The coefficients of the other fund characteristics are consistent with previous findings for the US mutual fund literature. Fund size is negatively related to performance, and family size is positively related (Chen, Hong, Huang, and Kubik, 2004). Total shareholder costs are negatively related to performance (Malkiel, 1995; Carhart, 1997; Gil-Bazo and Ruiz-Verdu, 2009).

Table IA11 in the Internet Appendix shows that estimates are consistent using different fund performance measures commonly used in the literature (benchmark-adjusted returns, excess return four-factor alphas, and information ratio). For example, we estimate that a one standard deviation increase in active share is associated with a 1% increase in future benchmark-adjusted returns. Table IA11 also shows that funds with higher active share perform better using the sample of non-US funds, weighted least squares, country fixed effects, the sample of domestic funds, and alternative active share measures (the pure ETF active share and the minimum active share) and controlling for the Amihud and Goyenko (2013) *R*-squared measure.

We next test the hypothesis that the presence of passive funds affects the returns to active management. To test this, in the performance regressions we include the market shares, the average costs of explicit indexing and closet indexing, and the interactions of these two variables with a fund's active share. Columns 2–4 of Table 7 present the estimates of the regressions. We find that fund performance is positively related to the market share of explicitly indexed funds in Column 2 of Panel B and negatively related to the average cost of explicit indexing in Column 3 in both Panels A and B. It suggests that active funds perform better in markets in which low-cost explicitly indexed funds are more available. This finding is consistent with the idea that enhanced competition by low-cost explicitly indexed funds spurs active funds to deliver better after-fee performance to investors. Moreover, the coefficient on the interaction between active share and the market share of explicitly indexed funds is negative and significant (in Panel B) and the interaction of active share and the average TSC of explicitly index funds is positive and significant (in both Panels A and B). We thus conclude that the marginal returns to active management are lower in mar-

Table 7
Determinants of the performance of active funds.

This table presents estimates of panel regressions in which the dependent variable is a fund's yearly benchmark-adjusted return four-factor alpha. Benchmark-adjusted return is the difference between the fund net return and its benchmark return. Four-factor alphas are estimated using three years of past monthly benchmark-adjusted fund returns in US dollars with regional factors (Asia, Europe, North America, or emerging markets) or world factors in the case of world funds. The sample includes open-end active equity mutual funds taken from Lipper for which holdings are available in LionShares from 2002 to 2010. In Panel A the unit of observation is a fund's primary share class *i* domiciled in country *j* in year *t*. In Panel B the unit of observation is a fund share class *s* offered for sale in country *k* in year *t*. All explanatory variables are lagged by one period. Regressions include year and benchmark dummies. See Appendix A for variable definitions. Robust *t*-statistics clustered by country of domicile-year (Panel A) or country of sale-year (Panel B) are reported in parentheses. *, **, and *** reflect significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Panel A: By country of domicile				
Active share	0.0319***	0.0362***	0.0171*	0.0230**
	(6.19)	(5.29)	(1.73)	(1.98)
Explicit indexing (%TNA)		0.0106		
		(0.43)		
Active share × explicit indexing (%TNA)		−0.0351		
		(−0.95)		
Explicit indexing (average TSC)			−0.0166**	
			(−2.34)	
Active share × explicit indexing (average TSC)			0.0163*	
			(1.75)	
Closet indexing (%TNA)				−0.0105
				(−0.41)
Active share × closet indexing (%TNA)				0.0255
				(0.75)
Tracking error	−0.0792***	−0.0793***	−0.0807***	−0.0781***
	(−3.28)	(−3.31)	(−3.27)	(−3.22)
Total shareholder cost	−0.0037***	−0.0037***	−0.0033***	−0.0037***
	(−4.60)	(−4.63)	(−4.09)	(−4.70)
Total net assets (log)	−0.0011***	−0.0011***	−0.0011**	−0.0011***
	(−2.62)	(−2.74)	(−2.55)	(−2.61)
Family total net assets (log)	0.0016***	0.0016***	0.0016***	0.0016***
	(5.53)	(5.38)	(5.26)	(5.55)
Fund age	−0.0000	−0.0000	−0.0000	−0.0000
	(−0.26)	(−0.29)	(−0.31)	(−0.30)
Flows	0.0022***	0.0021**	0.0020**	0.0022***
	(2.63)	(2.56)	(2.39)	(2.61)
International fund dummy	−0.0038	−0.0045	−0.0027	−0.0047
	(−0.80)	(−0.95)	(−0.56)	(−1.02)
Fund of fund dummy	−0.0116***	−0.0118***	−0.0120***	−0.0118***
	(−2.69)	(−2.72)	(−2.64)	(−2.74)
Off-shore fund dummy	0.0019	−0.0022	0.0080	0.0016
	(0.35)	(−0.30)	(1.07)	(0.29)
Approval	−0.0047	−0.0042	−0.0035	−0.0045
	(−1.43)	(−1.28)	(−0.95)	(−1.36)
Judicial	0.0006**	0.0005	0.0007**	0.0006**
	(2.33)	(1.53)	(2.47)	(2.32)
Fund industry size (log)	0.0003	0.0008	−0.0004	0.0005
	(0.26)	(0.62)	(−0.28)	(0.41)
Fund industry Herfindahl	−0.0105	−0.0012	−0.0091	−0.0108
	(−0.44)	(−0.05)	(−0.36)	(−0.44)
GDP per capita (log)	0.0001	0.0012	−0.0006	0.0007
	(0.03)	(0.29)	(−0.16)	(0.17)
Number of observations	51,570	51,570	50,007	51,570
R-squared	0.074	0.074	0.075	0.074
Panel B: By country of sale				
Active share	0.0549***	0.0722***	0.0350***	−0.0133
	(12.91)	(11.21)	(3.65)	(−1.03)
Explicit indexing (%TNA)		0.1196***		
		(4.16)		
Active share × explicit indexing (%TNA)		−0.1753***		
		(−4.21)		
Explicit indexing (average TSC)			−0.0158**	
			(−2.17)	
Active share × explicit indexing (average TSC)			0.0233**	
			(2.18)	
Closet indexing (%TNA)				−0.1391***
				(−3.81)

(*continued on next page*)

Table 7 (*continued*)

	(1)	(2)	(3)	(4)
Active share × closet indexing (%TNA)				0.2311***
				(4.67)
Tracking error	−0.1176***	−0.1178***	−0.1191***	−0.1196***
	(−5.14)	(−5.19)	(−5.17)	(−5.32)
Total shareholder cost	−0.0051***	−0.0052***	−0.0051***	−0.0052***
	(−15.39)	(−15.48)	(−15.24)	(−15.34)
Total net assets (log)	−0.0005***	−0.0005***	−0.0005***	−0.0005***
	(−6.40)	(−6.42)	(−6.32)	(−6.36)
Family total net assets (log)	0.0013***	0.0013***	0.0013***	0.0013***
	(5.63)	(5.29)	(5.48)	(5.97)
Fund age	0.0001***	0.0001***	0.0001***	0.0001***
	(4.92)	(4.77)	(4.87)	(4.59)
Flows	0.0000	0.0000	0.0000	0.0000
	(0.36)	(0.30)	(0.43)	(0.49)
International fund dummy	0.0019	0.0014	0.0018	−0.0002
	(0.60)	(0.44)	(0.58)	(−0.06)
Fund of fund dummy	−0.0023	−0.0027	−0.0026	−0.0033
	(−1.03)	(−1.20)	(−1.14)	(−1.45)
Off-shore fund dummy	−0.0042***	−0.0043***	−0.0043***	−0.0042***
	(−5.16)	(−5.27)	(−5.31)	(−5.27)
Approval	−0.0010	−0.0008	−0.0009	−0.0007
	(−1.65)	(−1.47)	(−1.44)	(−1.20)
Judicial	0.0001**	0.0001**	0.0001	0.0001**
	(2.17)	(2.15)	(1.47)	(2.49)
Fund industry size (log)	−0.0004	−0.0004	−0.0003	−0.0004
	(−1.21)	(−1.07)	(−0.97)	(−1.10)
Fund industry Herfindahl	−0.0079*	−0.0080	−0.0055	−0.0092**
	(−1.71)	(−1.55)	(−0.89)	(−2.03)
GDP per capita (log)	0.0010	0.0010	0.0011	0.0011
	(0.78)	(0.81)	(0.72)	(0.90)
Number of observations	346,711	346,711	340,940	346,711
R-squared	0.101	0.102	0.101	0.103

kets with more prevalent and cheaper explicitly indexed funds.

The coefficient on the market share of closet indexing is negative and significant (Column 4 of Panel B), and the interaction term with active share is positive and significant. These findings suggest that funds perform worse in markets in which so-called active funds are more generally passive with a consequent less competitive environment.

Finally, we examine the implication that the pension legislation should have resulted in changes in active fund performance by extending the differences-in-differences analysis. The results, reported in Table IA12 of the Internet Appendix, show that the coefficient on the *Post-Pension Act* (*year* $\geq$ 0) variable is positive and significant, which indicates that performance improves more for the treatment group funds than for the control group funds following the passage of the Pension Act. These results are consistent with those reported in Table 7.

7. Conclusion

We examine the consequences of indexing in the equity mutual fund industry across 32 countries. We test the hypothesis that growth in explicit indexing affects the competitive structure of mutual fund markets by forcing actively managed mutual funds to increase their active share (deviate more from the benchmark) and to lower their fees. Our evidence is consistent with this hypothesis. Markets with more competition from explicitly indexed funds display active funds that pursue more differentiated product strategies (i.e., funds exhibit higher active shares) to deliver alpha to investors and charge lower fees for active management. In contrast, in countries in which investors have limited options of paying lower fees for beta exposure through passive management, many active fund managers are effectively closet indexers who charge higher fees and under-perform. A quasi-natural experiment using the exogenous variation in the availability of indexed funds generated by the country adoption of defined contribution pension systems supports a causal interpretation of the results.

The primary implication of these results is that the growth of explicitly indexed funds worldwide enhances competition in the asset management industry. Further, the continued growth of index-based investing could have broader implications for markets and asset prices, which deserves increased attention from future research.

Appendix A. Variable definitions

A.1. Fund-level variables

Active share—Percentage of a fund's portfolio holdings that differ from its benchmark index holdings.

Tracking error—Standard deviation (annualized) estimated with three-year of past monthly benchmark adjusted return in US dollars.

Total shareholder cost—Annual total expense ratio plus one-fifth of the front-end load assuming a five-year holding period.

Total net assets—Total net assets in millions of US dollars.

Family total net assets—Total net assets in millions of US dollars of equity funds in the same management company excluding the own fund's TNA.

Fund age—Number of years since the fund launch date.

Flows—Percentage growth in TNA, net of internal growth (assuming reinvestment of dividends and distributions).

International fund dummy—Dummy that takes the value of one if a fund's geographic focus is different from the fund's country of domicile.

Fund of fund dummy—Dummy that takes the value of one if fund of fund.

Off-shore fund dummy—Dummy that takes the value of one if fund is located in an off-shore domicile.

Benchmark-adjusted return—Difference between the fund net return and its benchmark return (percentage per year).

Benchmark-adjusted return four-factor alpha—Four-factor alpha (percentage per year) estimated with three years of past monthly fund benchmark-adjusted returns in US dollars and regional factors (Asia, Europe, North America, or emerging markets) or world factors in the case of world funds.

A.2. Country-level variables

Explicit indexing (%TNA)—Percentage that explicitly indexed funds represent of the TNA of open-end equity mutual funds in the fund's country.

Explicit indexing (average TSC)—TNA-weighted average total shareholder cost of explicitly indexed funds in the fund's country.

Closet indexing (%TNA)—Percentage that active funds with active share below 0.6 represent of the TNA of open-end equity mutual funds in the fund's country.

Approval—Sum of two dummy variables that take the value of one if (1) the fund startup requires regulatory approval and (2) the prospectus requires regulatory approval (Khorana, Servaes, and Tufano, 2005).

Judicial, Judicial system quality defined as the sum of five variables (all variables are scaled between 0 and 10): the efficiency of the judicial system, rule of law, corruption, risk of expropriation and risk of contract repudiation (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1998).

Fund industry size—Sum of total net assets (in millions of US dollar) for open-end equity mutual funds in the fund's country.

Fund industry Herfindahl—Sum of squared market shares of fund management companies for open-end equity mutual funds in the fund's country.

GDP per capital—Gross domestic product per capita in US dollars in the fund's country (World Development Indicators).

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