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The implications of passive investments for active fund management: International evidence

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ABSTRACT

This paper investigates how the tremendous growth in indexed investments has affected active management in the equity mutual fund industry across 32 countries. Our findings indicate that the growing competition from passive funds does not reduce the fees of actively managed funds. Moreover, active funds do not increase their product differentiation by diverging more from their benchmarks when they face more competitive pressure from indexed products, though they do sometimes charge higher fees and reduce their activity. Thus, our tests indicate that indexed and active funds can coexist and attract different clienteles.

1. Introduction

The equity fund industry has grown tremendously since the 2007–2008 global financial crisis. The total volume of assets under management in equity funds globally jumped from US$ 11.9 trillion as of December 2010 to US$ 19.9 trillion as of December 2018, representing a compound annual growth of 6.64% per year (Investment Company Institute, 2019). This expansion has been driven mostly by the exponential growth in passive funds. In the United States, for example, the total net assets (TNA) of these funds increased from US$ 379.69 billion at the end of 2002 to US$ 5.318 trillion at the end of 2018. Exchange-traded funds (ETFs) and indexed equity mutual funds together represented 44.7% of all US equity fund assets in 2018; this share grew significantly from 2002, when such funds accounted for approximately 13.9% of these assets. The rise in market share was magnified between 2007 and 2018, when such funds gained 26.1% in market share in terms of TNA, compared with 4.7% accumulated from 2002 until 2007 (Investment Company Institute, 2019).

Passive funds are investment vehicles that provide diversified portfolios at a low cost. In the stock market, these funds adopt the strategy of tracking returns of stock indexes established as benchmarks in specific markets. As a result, passively managed funds have become a lower-priced alternative to active funds for investing in a well-diversified portfolio that follows the movement of a market index. Indexed mutual funds were first offered in the 1970s, while the first ETFs were launched in the 1990s. Like other indexed funds, ETFs also intend to replicate the performance of their benchmarks. However, ETFs are listed and traded on stock exchanges. According to Deville (2008), in addition to opportunities for diversification at lower management fees, these funds offer investors improved tax efficiency and transparency, since their portfolios are disclosed at the end of each trading day.

Many academic papers have analyzed the relative value of active versus passive management. Some of them have found evidence

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that active funds fail to generate excess returns, so investors benefit more from low-cost indexed products (Busse, Goyal, & Wahal, 2014; Carhart, 1997; Fama & French, 2010; Gruber, 1996; Jensen, 1968; Malkiel, 1995). But other studies have found evidence of a Grossman and Stiglitz (1980) equilibrium, meaning that the expected benefits of information gathering and processing should be equal to their costs (Berk & van Binsbergen, 2015; Kacperczyk & Seru, 2007; Wermers, 2000). In accordance with studies that have identified the investment ability of active fund managers, Cremers and Petajisto (2009) introduced a new activity measure that calculated the proportion of a fund's holdings that diverged from its benchmark. The authors showed that funds with portfolios that deviated more from their benchmarks achieved significantly higher performance and that such superior performance was persistent.

Although the literature on mutual funds is vast, studies exploring the fund industry as a whole and the competitive forces operating in this sector are scarce. In recent decades, papers have begun to explore more general characteristics of the fund industry worldwide. Elton, Gruber, and Busse (2004) investigated the reasons for the substantial variation in management fees and performance even in an extremely homogeneous group of Standard & Poor's 500 indexed funds, and attributed this fact, at least in part, to investors' irrationality. Hortaçsu and Syverson (2004) argued that investors differ in service preferences and investment search costs, and therefore gauge indexed funds differently. Thus, quality differentiation in the form of additional services might explain the discrepancies in management fees.

Attempting specifically to understand whether the fund industry's market structure was conducive to competition, Coates and Hubbard (2007) examined the telling escalation in the number of class action suits against mutual funds since 2003 for charging excessive management fees. The researchers refuted the hypothesis that the industry was not competitive, finding evidence that entry barriers were low, there had been steady introduction of new funds and real expansion of TNA, and management fees had diminished over time. Furthermore, Khorana and Servaes (2011) pointed out that price competition and product differentiation were effective strategies for garnering market share in this industry. Wahal and Wang (2011) also found that the mutual fund market was competitive and revealed that the entry of new active funds that closely resembled existing ones pushed the incumbents to lower their fees. Nevertheless, distribution fees also increased, indicating that investors did not benefit from this price competition.

More recent studies have addressed the profound changes in the investment fund industry emerging from the growth of passive investments. Sushko and Turner (2018) identified some drivers of this expansion, such as a superior performance of passive funds compared to active funds. Recent empirical studies have agreed that after deducting expenses, active funds underperformed the market portfolio over various time frames (Busse et al., 2014; Fama & French, 2010; Malkiel, 2013). Sushko and Turner (2018) also emphasized that some important structural developments in the financial industry have contributed to the growth of indexed funds: the emergence of platforms that offered automated investment management services at lower costs; a greater focus of regulators on the transparency of fees in some jurisdictions; and a more extensive use of information technology, enabling new market indices to be created.

Other papers have been more concerned with the consequences of the increase in passive investments. Anadu, Kruttli, McCabe, Osambela, and Shin (2019) examined the impacts of this growth on the stability of financial markets through various channels and concluded that it lessened the risks of transformation into liquidity and redemptions, increased market volatility, and heightened concentration in the asset management industry. Appel, Gormley, and Keim (2016) investigated the effects of indexed funds' growth on the governance of companies in such funds' portfolios.

Our study is closely related to that of Cremers, Ferreira, Matos, and Starks (2016), who focused on the worldwide impacts of the substantial increase in the number of indexed funds on competition within the asset management industry itself. The authors observed that actively managed equity funds had boosted activity and lowered fees, and that they generated growth in alpha, under more robust competitive pressure from low-cost indexed products. In contrast, other studies suggested that the active and passive fund markets were segmented and that investors did not regard these investment vehicles as substitutes. For example, Collins (2005) noted that a heterogeneous market supported different needs and pricing structures, even among indexed funds.

According to Cremers et al. (2016), if mutual fund markets were segmented, active funds that lost market share to indexed products might raise their management fees to cover higher marketing expenses, instead of reducing them. Such behavior was witnessed in the pharmaceutical industry following the introduction of generic products; neither their entry nor their market penetration put pressure on the prices of branded medicines, which instead eventually rose (Frank & Salkever, 1997; Vandoros & Kanavos, 2013).

Similarly, if active and passive funds were not seen as competitors, growth in the market share of indexed funds should not push managers to increase their own activity and might indeed produce disincentives for them to collect information. Wurgler (2011) noted that managers of benchmarked active funds could distinguish between index and nonindex members and were more prone to trading stocks in the index. According to the author, this ability could distort stock prices and the risk-return compensation, discouraging active fund managers from gathering information and causing them to reduce their activity by deviating less from their benchmarks.

We attempt to identify whether increased competition from indexed funds has caused active funds to compete more via price, by lowering fees, or via product differentiation, by expanding active share and delivering excess returns. To test this hypothesis, we use data collected from the Reuters-Lipper platform between 2008 and 2018 for ETFs and open-end equity mutual funds from 32 countries. We argue that after the crisis, investors were more inclined toward passive investments. In prolonging the postcrisis period of the sample, we extend the study of Cremers et al. (2016). We also use data for the period before the crisis, between 2002 and 2007, to test whether the crisis may have catalyzed a change in investor behavior, and report these precrisis results in the appendices.

Fichtner, Heemskerk, and Garcia-Bernardo (2017) pointed out that before the 2007–2008 global financial crisis, most investors tolerated higher fees in the hope that active mutual funds would earn greater extraordinary returns. Nevertheless, investors realized that the majority of actively managed mutual funds were unable to persistently generate higher returns than their established benchmarks. According to the Financial Times (2019), this was especially true during the 2007–2008 financial crisis, when the majority of active funds were unable to limit investor losses or even earn a profit.

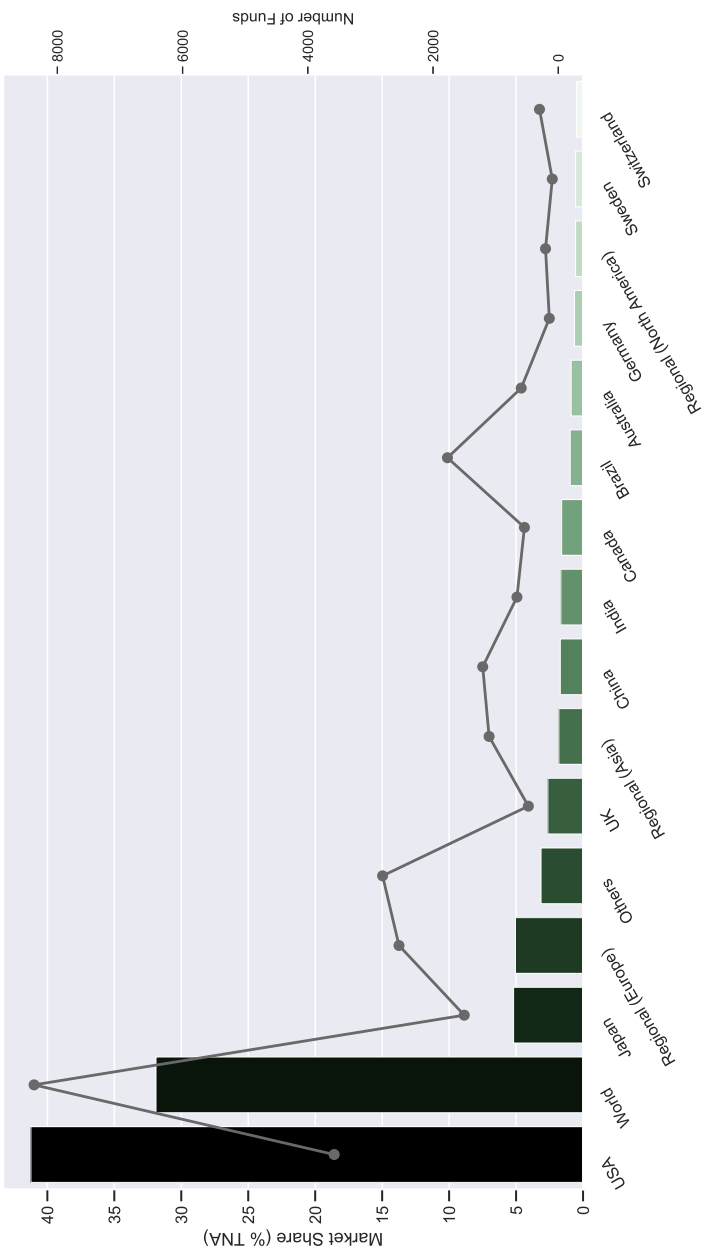

Fig. 1. Distribution of market share (as a percentage of global TNA) and the number of mutual funds and ETFs by geographic focus (assigned by the fund), as of December 2018. The sample includes open-end equity mutual funds and ETFs by country of domicile.

Other studies have found that indexed funds are less performance sensitive than active funds (Anadu et al., 2019; Sushko & Turner, 2018). According to them, there are various other reasons why indexed funds are more stable in times of crisis, such as the fact that the absence of fund manager discretion might make some investors less prone to move their money in and out of the fund in response to funds' performance and the fact that investors seek to minimize their costs and trading fees during a crisis. Cremers et al. (2016) indicated that the most pronounced growth in the market share of indexed funds occurred after the 2007–2008 financial crisis, although their sample, which covered the period between 2002 and 2010, captured only the most limited part of this growth. Assets under management in their sample of indexed funds jumped from 14% in 2002 to 22% in 2010. In contrast, our sample captures a much longer period after the crisis, from 2008 to 2018.

Another respect in which this paper differs from the study of Cremers et al. (2016) is that the measure of fund activity we use is based on fund returns, according to the model proposed by Amihud and Goyenko (2013), which identifies the proportion of the fund's variance due to idiosyncratic risk ($1 - R^2$). Return-based activity measures, such as that of Amihud and Goyenko (2013), have been widely used in the mutual fund literature (Herrmann, Rohleder, & Scholz, 2016; Idzorek & Bertsch, 2004; Müller & Weber, 2012; Roll, 1992; Wermers, 2000) because of problems with other approaches. Cremers et al. (2016), for instance, used a holdings-based activity measure, which calculated the percentage of a fund's portfolio that differed from its benchmark. But there may be a discrepancy between the real characteristics of the fund's portfolio over a specific period and the portfolio reported by managers at the beginning or end of that period, as many studies have reported the practice of window dressing in mutual fund management (Agarwal, Gay, & Ling, 2014; Carhart, Kaniel, Musto, & Reed, 2002; Elton, Gruber, Blake, Krasny, & Ozelge, 2010; Musto, 1999). Nevertheless, several studies have reported similar results using holdings-based and return-based activity measures. For example, both Cremers and Petajisto (2009), using active share, and Amihud and Goyenko (2013), using $1 - R^2$, found that higher mutual fund activity predicted significantly better performance. Cremers et al. (2016) also observed that higher active shares were associated with greater alphas. Amihud and Goyenko (2013) even reported that the correlation between R^2 of funds in the researchers' sample and active share was negative, as expected, with a median of -0.46, again underscoring that these two measures of activity were closely related. In another related study, Kenchington, Wan, and Yüksel (2019), using both of these two measures, found that funds with high gross profitability investment measures (GPIM) had significantly higher levels of activity.

The rest of this paper is organized as follows. Section 2 describes our data and the method we use. Section 3 presents a comprehensive study of the active and indexed fund industries worldwide. Section 4 explores the main empirical findings we have obtained. Finally, section 5 concludes the paper and suggests possible directions of future research in this field.

2. Method

2.1. Data

This paper focuses exclusively on open-end equity mutual funds and ETFs with data available on the Reuters-Lipper platform for the period from 2002 to 2018. Note that we use the period between 2002 and 2007 only to test whether the crisis may have catalyzed a change in investors' behavior; we present the results of these tests in the appendices. Our main tests pertain to the period between 2008 and 2018 (see section 4). For each fund in this sample, we collected the following data: fund name, Lipper fund classification, country of domicile, country of sale, benchmark independently assigned by Lipper, fund objectives, management company, status, geographic focus, year of launch, monthly net asset values, monthly TNA, management fees, and total expense ratios. For our analyses, we classified the fund type as indexed or active according to the objectives stated in the most recent prospectus and listed by Reuters-Lipper. We complemented the database with the monthly closing values of each benchmark, using the technical benchmarks independently assigned by Reuters-Lipper according to its assessment of each fund's investment strategy. We used technical benchmarks rather than those assigned by fund managers, following Cremers et al. (2016), to avoid concerns that the fund would strategically choose its benchmark and increase sample size because that benchmark was rarely available. We also excluded funds that did not present any information about their benchmarks, as well as those for which the benchmarks had no trading value in the databases we had available (Bloomberg, Capital IQ, and Reuters-Lipper).

We then classified the funds by country of sale or domicile, following other cross-country mutual fund studies (Cremers et al., 2016; Khorana, Servaes, & Tufano, 2008). This distinction is important since some funds are registered for sale in more than one country. According to Khorana et al. (2008), funds domiciled in countries such as Canada and the United States are normally sold only in their domestic markets, since these countries have more restrictions on the cross-border sales of funds. However, in more integrated markets, such as Europe, and offshore countries (Ireland, Luxembourg), funds domiciled in a given country are generally approved for sale in several other markets. Were our analysis limited to the fund's country of domicile, we would assume that this fund is sold exclusively in its home country. Since some funds have multiple share classes and are offered in more than one country, it is possible to have several observations for the same fund in a given year when considering its country of sale. Therefore, our sample ultimately consisted of 27,053 funds, with TNA amounting to approximately US$ 9 trillion as of December 2018. The data are free of survival bias because they include active funds and funds that have already been liquidated. These funds are traded in 32 countries and track 212 different benchmarks. The geographic focus defined by each fund is global, regional, or local. Fig. 1 shows the distribution of TNA by geographic focus. The United States is the target area of 3,579 investment funds, which own more than 40% of global assets under management. Another 8,372 funds have a global focus and represent approximately 32% of global TNA. Table A.1, in Appendix A, shows a detailed breakdown of TNA and the number of funds by geographic focus.

2.2. Variables

- Fund-level variables:
  - Benchmark-adjusted return is the percentage difference between the fund's net return for the year and its benchmark return for that same year.
  - Four-factor alpha is the annualized fund's excess return estimated with rolling regressions using the fund's benchmark-adjusted returns over the previous 24 months in US dollars, following the recent performance measurement literature (Cremers et al., 2016; Sensoy, 2009). We considered the previous 24 months, following Del Guercio and Reuter (2014) and James and Karceski (2006). To obtain impartial alphas for funds, we applied the benchmark adjustment of the four-factor model of Carhart (1997), following Angelidis, Giamouridis, and Tessaromatis (2013). We used regional or global factors according to the geographic focus attributed to the fund, using the Fama-French (F—F) factor data from the website of Kenneth French and the 1-month US Treasury bill as our risk-free parameter. Note that for the purposes of measuring alpha, active share, and tracking error, we utilized the net asset value (NAV) information from 24 months before the first year of calculation. For example, alpha for 2008 or 2002 was determined from the NAV information of funds from the beginning of 2006 or 2000, respectively. Thus, alpha is the excess return of a mutual fund f over benchmark b in period y. MKT is the equity market return over the risk-free rate in US dollars in period y, while SMB, HML, and MOM are size, value, and momentum factors, respectively (Carhart, 1997), all at time y, as described in Eq. (1).

$$R_{f,y} - R_{b,y} = \alpha_f + \beta_1 \mathrm{MKT}_y + \beta_2 \mathrm{SMB}_y + \beta_3 \mathrm{HML}_y + \beta_4 \mathrm{MOM}_y + \epsilon_{f,y} \tag{1}$$

  - Active share is the annualized percentage of activity of a fund, calculated according to the model proposed by Amihud and Goyenko (2013). We derived this measure from the fund's R^2, estimated with rolling regressions to calculate the four-factor alpha. Fund activity is given by $1 - R^2$, i.e., the proportion of the variation in fund returns that is due to idiosyncratic risk.
  - Tracking error is the annualized standard deviation estimated with the previous 24 months of the funds' returns adjusted by the benchmark in US dollars. We derived this measure following Cremers and Petajisto (2009), as described in Eq. (2). Thus, the tracking error is the standard deviation of the difference in returns between mutual fund f and benchmark b in month m:

$$\text{Tracking error}_{f,m} = \sigma\left[R_{f,m} - R_{b,m}\right] \tag{2}$$

  - TER represents the investors' fees calculated according to the TER concept, which encompasses more than management fees since it includes administration and management costs, as well as maintenance, auditing, and legal expenditures, etc. If TERs were unavailable, management fees were used.
  - Total net assets (TNA) are given in US dollars.
  - Family total net assets equal TNA in US dollars in the same asset management company, excluding the TNA of the fund itself.
  - Age is the number of years since the fund's launch date.
  - Flow is the fund's percentage growth in TNA, net of its internal growth. Thus, the flow of dollars to fund f in year y is given by dividing the fund's TNA in year y by TNA in the previous year, less the fund's return in year y, as described in Eq. (3).

$$\mathrm{Flow}_{f,y} = \frac{TNA_{f,y}}{TNA_{f,y-1}} - \left(1 + R_{f,y}\right) \tag{3}$$

- Country-level variables:
  - Indexing ratio (%TNA) is the percentage of market share, in terms of TNA, of indexed funds relative to the fund industry as a whole in the fund's country of sale or domicile.
  - Indexed funds TER is a TNA-weighted average of the TERs of indexed funds in a fund's country of sale or domicile.
  - Approval is calculated, following Khorana, Servaes, and Tufano (2005), Khorana et al. (2008), and Cremers et al. (2016), as a sum of two variables that have a value of one if (1) fund startup requires a regulatory approval, and (2) the prospectus requires a regulatory approval. This variable is fixed over time but varies by country.
  - Judicial is a variable that identifies the quality of the judicial system in each country. We measured it following Khorana et al. (2005), who summarized the five variables developed by La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998): efficiency of the judicial system, rule of law, corruption, risk of expropriation, and risk of breach of contract. Each variable is measured on a scale of 1 to 10, with a higher value implying better quality, and the final value of the variable representing the quality of a judicial system is the total of these five measures. Again, this variable is fixed over time but varies by country.
  - Fund industry size is calculated as the sum of TNA values in dollars for open-end equity mutual funds and ETFs in the fund's country of sale or domicile.
  - Fund industry Herfindahl index ("Fund ind. Herfindahl") measures industry concentration. It is calculated as a sum of squared market shares of fund management companies for open-end equity mutual funds and ETFs in the fund's country of sale or domicile. The index ranges from 0 to 10,000 points, with a higher value indicating greater industry concentration.
  - GDP per capita is the gross domestic product per capita in US dollars in the fund's country of sale or domicile, according to World Bank data.

2.3. Descriptive statistics

Table 1 provides the main descriptive statistics for the active mutual funds in the sample for the period between 2008 and 2018 by country of sale (Panel A) and domicile (Panel B) of the fund. This table confirms that passive investment vehicles have significantly lower costs than do active investment products.

Both alphas and benchmark-adjusted returns are negative for active funds in the sample by country of sale or domicile, although their average active shares are higher than 60%. In addition to the fund-level summary statistics reported in Table 1, Table B.1 in Appendix B summarizes the averages of time series of country-level variables by country of domicile. Finally, Figure C.1 in Appendix C presents the correlation matrix of all key variables used in fund-level tests, for the sample of open-end active mutual funds from 2008 to 2018 by country of domicile.

2.4. Statistical methods

Initially, we divided the sample into two subsamples to perform the statistical tests reported in this study. The first subsample comprises the country-level panel data, and the second encompasses the fund-level panel data, for actively managed funds only. A wide range of studies on law and economics have inferred that legal and regulatory factors can explain discrepancies in the pace of financial development across countries. Khorana et al. (2005) indicated that such factors had positive impacts on the size of the mutual fund industry, and Khorana et al. (2008) reported that fees were lower in countries with more effective judicial systems and more stringent regulations. Cremers et al. (2016), addressing the question whether the growth in the market share of low-cost passive funds increased competition, found evidence that their market share should be higher in tightly regulated environments and more developed fund industries.

Our country-level tests explore the factors determining indexed funds' market shares and TERs across countries. The independent

Table 1
Descriptive statistics of active mutual funds by country of sale and domicile, 2008–2018.

Panel A: statistics by country of sale				
Variable	Obs.	Median	Mean	Std. Dev.
TNA (millions of dollars)	414,482	62.33	322.22	1207.94
Family TNA (millions of dollars)	574,827	2326.39	9187.50	29,636.62
TER (%)	402,809	1.80	1.75	0.65
Indexing ratio	574,827	0.23	0.27	0.16
Indexed funds TER (%)	574,827	0.37	0.39	0.18
Active funds TNA (millions of dollars)	574,827	458,375.58	525,810.12	453,195.68
Indexed funds TNA (millions of dollars)	574,827	162,902.40	246,384.24	330,450.22
Flows	373,647	0.04	446.04	226,886.36
Industry size (millions of dollars)	574,827	652,929.05	772,194.36	755,335.30
Fund ind. Herfindahl	574,827	405.68	623.41	591.13
4-factor alpha	363,842	−0.01	−0.01	0.13
Benchmark-adj. return	416,777	−0.02	−0.02	0.17
Tracking error	363,518	0.06	0.10	0.15
Active share	363,842	0.64	0.62	0.19
GDP per capita (dollars)	570,675	46,543.79	49,475.37	23,427.93
Approval	574,827	1.00	1.48	0.50
Judicial	574,827	47.00	43.37	6.48
Age (years)	395,632	9.00	10.71	8.37
Panel B: Statistics by Country of Domicile				
Variable	Obs.	Median	Mean	Std. Dev.
TNA (millions of dollars)	160,491	40.10	301.47	1643.18
Family TNA (millions of dollars)	160,491	2134.37	12,377.67	48,997.01
TER (%)	154,910	1.60	1.64	0.80
Indexing ratio	238,102	0.15	0.22	0.17
Indexed funds TER (%)	235,466	0.36	0.46	0.32
Active funds TNA (millions of dollars)	238,128	126,997.70	390,102.92	693,750.23
Indexed funds TNA (millions of dollars)	238,128	37,972.65	197,070.43	485,300.77
Flows	139,696	0.02	1065.87	370,894.85
Industry size (millions of dollars)	238,128	172,394.83	587,173.35	1,163,387.70
Fund ind. Herfindahl	238,128	787.42	1042.55	801.70
4-factor alpha	132,633	−0.02	−0.02	0.10
Benchmark-adj. return	156,446	−0.03	−0.03	0.16
Tracking error	132,421	0.08	0.11	0.11
Active share	132,633	0.66	0.63	0.19
GDP per capita (dollars)	235,090	48,071.72	49,897.14	29,410.39
Approval	236,434	2.00	1.51	0.50
Judicial	236,434	45.00	40.77	7.51
Age (years)	155,718	9.00	10.60	8.74

variables in the two tests are (1) the logarithm of fund industry size, (2) the logarithm of GDP per capita, (3) the fund industry's Herfindahl index, (4) judicial system quality, (5) approval, and (6) active funds' average age. The regressions also include year fixed effects as used by Cremers et al. (2016) to alleviate concerns that the increased availability of indexed products may be related to unobservable characteristics that vary over time and explain the market shares and the TERs of these products in each country. The regressions used in these tests are shown in Equations (4) and (5).

$$\begin{aligned}\text{Indexing Ratio}_{c,y} &= \beta_0 + \beta_1 \text{logIndustry.size}_{c,y} + \beta_2 \text{logGDP}_{c,y} + \beta_3 \text{Herfindahl}_{c,y} \\ &= +\beta_4 \text{Judicial}_{c,y} + \beta_5 \text{Approval}_{c,y} + \beta_6 \text{Age}_{c,y} + \text{f}_y + \epsilon_{c,y}\end{aligned} \tag{4}$$

$$\begin{aligned}\text{Indexed Funds TER}_{c,y} &= \beta_0 + \beta_1 \text{logIndustry.size}_{c,y} + \beta_2 \text{logGDP}_{c,y} + \beta_3 \text{Herfindahl}_{c,y} \\ &= +\beta_4 \text{Judicial}_{c,y} + \beta_5 \text{Approval}_{c,y} + \beta_6 \text{Age}_{c,y} + \text{f}_y + \epsilon_{c,y}\end{aligned} \tag{5}$$

In the analyses related to the potential consequences of the growth of passive investments for the management of active funds, we use our fund-level panel data. Since the market share and costs of indexed funds could be related to unobserved country or benchmark characteristics that simultaneously determine the active share and fees of active funds, we apply country and benchmark fixed effects in all of the fund-level regressions.

The country fixed effects capture variations that are due to characteristics of the fund's country of sale or domicile (Ferreira, Keswani, Miguel, & Ramos, 2013; Khorana et al., 2008), while the benchmark fixed effects catch abnormalities due to the fund's investment objectives (Adams, Mansi, & Nishikawa, 2012; Cremers et al., 2016). All of the fund-level regressions also include year fixed effects as used by Cremers et al. (2016) to mitigate concerns that the expanded availability of indexed products may be related to unobservable characteristics that vary over time. We also control for other fund and country characteristics in our subsequent tests. In all of the regressions, the standard errors are clustered by country.

Initially, our fund-level tests are meant to determine whether the intensified competition from indexed funds has caused active equity funds to compete more via product differentiation as measured by the fund's active share. Equation (6) examines the association between active funds' activity and the market share of passive funds in each country (Indexing.ratio), while Equation (7) explores the relationship between this level of activity and the TNA-weighted TERs of indexed funds in each country (Index.TER).

$$\begin{aligned}\text{ActiveShare}_{f,y} &= \beta_0 + \beta_1 \text{Indexing.ratio}_{c,y} + \beta_2 \text{Tracking.error}_{f,y} + \beta_3 \text{TER}_{f,y} \\ &= +\beta_4 \text{logTNA}_{f,y} + \beta_5 \text{logFamily.TNA}_{f,y} + \beta_6 \text{Age}_{f,y} \\ &= +\beta_7 \text{Flows}_{f,y} + \beta_8 \text{logIndustry.size}_{c,y} + \beta_9 \text{logGDP}_{c,y} \\ &= +\beta_{10} \text{Herfindahl}_{c,y} + \text{f}_c + \text{f}_y + \text{f}_b + \epsilon_{f,y}\end{aligned} \tag{6}$$

$$\begin{aligned}\text{ActiveShare}_{f,y} &= \beta_0 + \beta_1 \text{Index.TER}_{c,y} + \beta_2 \text{Tracking.error}_{f,y} + \beta_3 \text{TER}_{f,y} \\ &= +\beta_4 \text{logTNA}_{f,y} + \beta_5 \text{logFamily.TNA}_{f,y} + \beta_6 \text{Age}_{f,y} \\ &= +\beta_7 \text{Flows}_{f,y} + \beta_8 \text{logIndustry.size}_{c,y} + \beta_9 \text{logGDP}_{c,y} \\ &= +\beta_{10} \text{Herfindahl}_{c,y} + \text{f}_c + \text{f}_y + \text{f}_b + \epsilon_{f,y}\end{aligned} \tag{7}$$

We also attempt to determine whether increased competition from indexed funds has caused active funds to compete more via price by lowering their fees. Equation (8) investigates the association between active funds' fees and the market share of indexed funds in each country (Indexing.ratio), while Equation (9) analyzes the relationship between these fees and the TNA-weighted TERs of passive funds in each country (Index.TER). Since we examine the effects of temporal changes in the market share of indexed funds, we employ a three-year moving average of this dependent variable. We do not do the same for the other two dependent variables, active share and four-factor alpha, as these variables already have historical components. Note that to measure alpha and the active share, we used net asset value (NAV) information from 24 months before the year of calculation. For example, active share or alpha for 2008 or 2002 was determined from NAV information for the beginning of 2006 or 2000, respectively.

$$\begin{aligned}\text{TER}_{f,y} &= \beta_0 + \beta_1 \text{Indexing.ratio}_{c,y} + \beta_2 \text{Active.share}_{f,y} + \beta_3 \text{Tracking.error}_{f,y} \\ &= +\beta_4 \text{logTNA}_{f,y} + \beta_5 \text{logFamily.TNA}_{f,y} + \beta_6 \text{Age}_{f,y} + \beta_7 \text{Flows}_{f,y} \\ &= +\beta_8 \text{Benchmark.adj.returns}_{f,y} + \beta_9 \text{logIndustry.size}_{c,y} + \beta_{10} \text{logGDP}_{c,y} \\ &= +\beta_{11} \text{Herfindahl}_{c,y} + \text{f}_c + \text{f}_y + \text{f}_b + \epsilon_{f,y}\end{aligned} \tag{8}$$

$$\begin{aligned}\text{TER}_{f,y} &= \beta_0 + \beta_1 \text{Index.TER}_{c,y} + \beta_2 \text{Active.share}_{f,y} + \beta_3 \text{Tracking.error}_{f,y} \\ &= +\beta_4 \text{logTNA}_{f,y} + \beta_5 \text{logFamily.TNA}_{f,y} + \beta_6 \text{Age}_{f,y} + \beta_7 \text{Flows}_{f,y} \\ &= +\beta_8 \text{Benchmark.adj.returns}_{f,y} + \beta_9 \text{logIndustry.size}_{c,y} + \beta_{10} \text{logGDP}_{c,y} \\ &= +\beta_{11} \text{Herfindahl}_{c,y} + \text{f}_c + \text{f}_y + \text{f}_b + \epsilon_{f,y}\end{aligned} \tag{9}$$

Our final test examines how the changes in a fund's active share and the indexing level in its country could affect the fund's performance, as measured by the alphas generated by this fund. All estimates are made in US dollars, and all independent variables are lagged by one year. Equation (10) investigates the association between active funds' alphas and the market share of passive products in each country (Indexing.ratio), while Equation (11) explores the relationship between these active funds' alphas and the TNA-weighted TERs of indexed funds in each country (Index.TER).

$$\begin{aligned}\text{alpha}_{f,y} &= \beta_0 + \beta_1 \text{Indexing.ratio}_{c,y-1} + \beta_2 \text{Active.share}_{f,y-1} + \beta_3 \text{Tracking.error}_{f,y-1} \\ &= +\beta_4 \text{TER}_{f,y-1} + \beta_5 \text{logTNA}_{f,y-1} + \beta_6 \text{logFamily.TNA}_{f,y-1} \\ &= +\beta_7 \text{Age}_{f,y-1} + \beta_8 \text{Flows}_{f,y-1} + \beta_9 \text{logIndustry.size}_{c,y-1} \\ &= +\beta_{10} \text{logGDP}_{c,y-1} + \beta_{11} \text{Herfindahl}_{c,y-1} + \text{f}_c + \text{f}_y + \text{f}_b + \epsilon_{f,y}\end{aligned} \tag{10}$$

$$\begin{aligned}\text{alpha}_{f,y} &= \beta_0 + \beta_1 \text{Index.TER}_{c,y-1} + \beta_2 \text{Active.share}_{f,y-1} + \beta_3 \text{Tracking.error}_{f,y-1} \\ &= +\beta_4 \text{TER}_{f,y-1} + \beta_5 \text{logTNA}_{f,y-1} + \beta_6 \text{logFamily.TNA}_{f,y-1} \\ &= +\beta_7 \text{Age}_{f,y-1} + \beta_8 \text{Flows}_{f,y-1} + \beta_9 \text{logIndustry.size}_{c,y-1} \\ &= +\beta_{10} \text{logGDP}_{c,y-1} + \beta_{11} \text{Herfindahl}_{c,y-1} + \text{f}_c + \text{f}_y + \text{f}_b + \epsilon_{f,y}\end{aligned} \tag{11}$$

To check the robustness of our statistical tests, we estimate regressions for several different subsamples. First, we use a sample of non-US-domiciled funds to alleviate concerns that our results are driven by the considerable proportion of funds domiciled in the United States, which accounts for 57.15% of the TNA of the full sample. For the same reason, we also test funds sold only or domiciled in the United States. We also test a sample of countries where more than 20 passive funds are domiciled or sold, to mitigate concerns that the market share of indexed funds from such countries may be distorted. Finally, we test a sample of non-US-domiciled funds that account for more than 0.75% of the TNA of the full sample, to mitigate concerns that very small and negligible industries may influence our results. This sample ultimately covers 14 countries that account for 38.11% of the TNA of the full sample; it excludes 17 countries that together account for only 4.74% of the total TNA.

Additionally, we consider alternative methods of estimating alphas, such as the capital asset pricing model (CAPM). We also estimated the tests before the crisis, between 2002 and 2007, and the results were similar to those of Cremers et al. (2016), indicating that our variable and regression specifications did not seem to be decisive in obtaining distinct results after the crisis. All other robustness tests are consistent with our hypothesis. The results of all of these tests are reported in the appendices.

3. Active and passive equity fund market worldwide

3.1. Market share

Fig. 2 illustrates the expansion of the TNA of passive investment vehicles compared to actively managed funds in our sample between 2002 and 2018. While the total assets of active funds grew by approximately 375%, those of indexed funds jumped by more than fourteenfold—from US$0.257 trillion in 2002 to US$3.668 trillion in 2018, when they reached a market share of approximately 43%, measured as a percentage of TNA. Only after the financial crisis did the market share of indexed funds experience growth, of approximately 19.8%; between 2002 and 2007 their market share contracted by approximately 1.6%. The Financial Times (2019) emphasized that the past decade had been shaped by the aftershocks of the financial crisis and the rise of passive investments, further

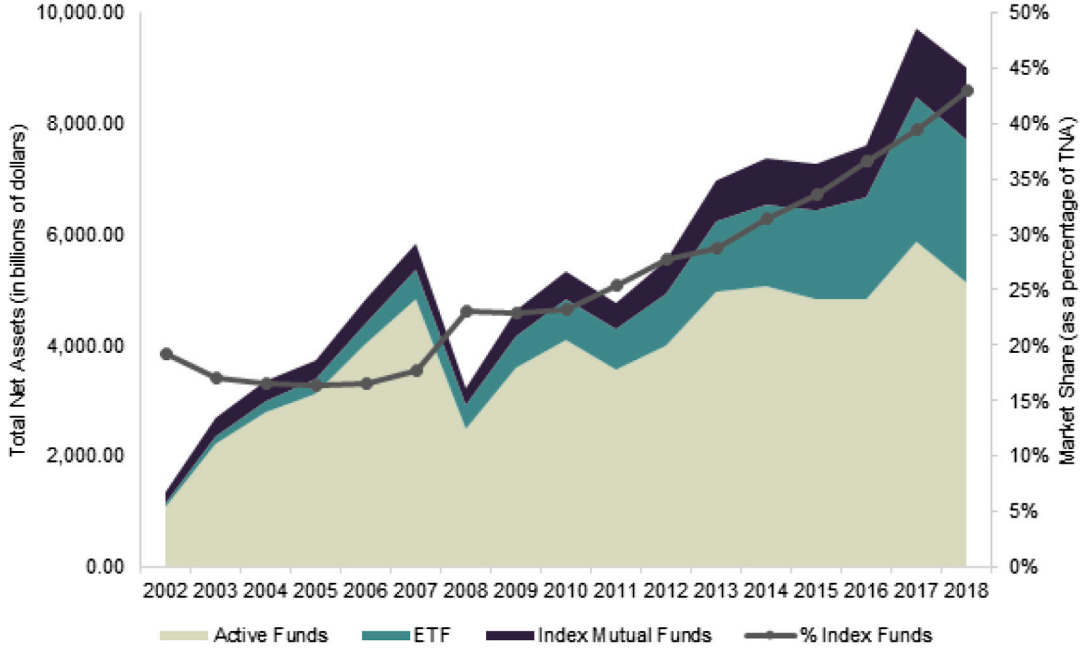

Fig. 2. TNA and market share of indexed mutual funds, ETFs, and active funds by year. This figure shows the yearly TNA and market share percentages, measured against the TNA held by indexed equity mutual funds, ETFs, and active funds by country of domicile of funds. The sample includes open-end mutual funds and ETFs from our database between 2002 and 2018.

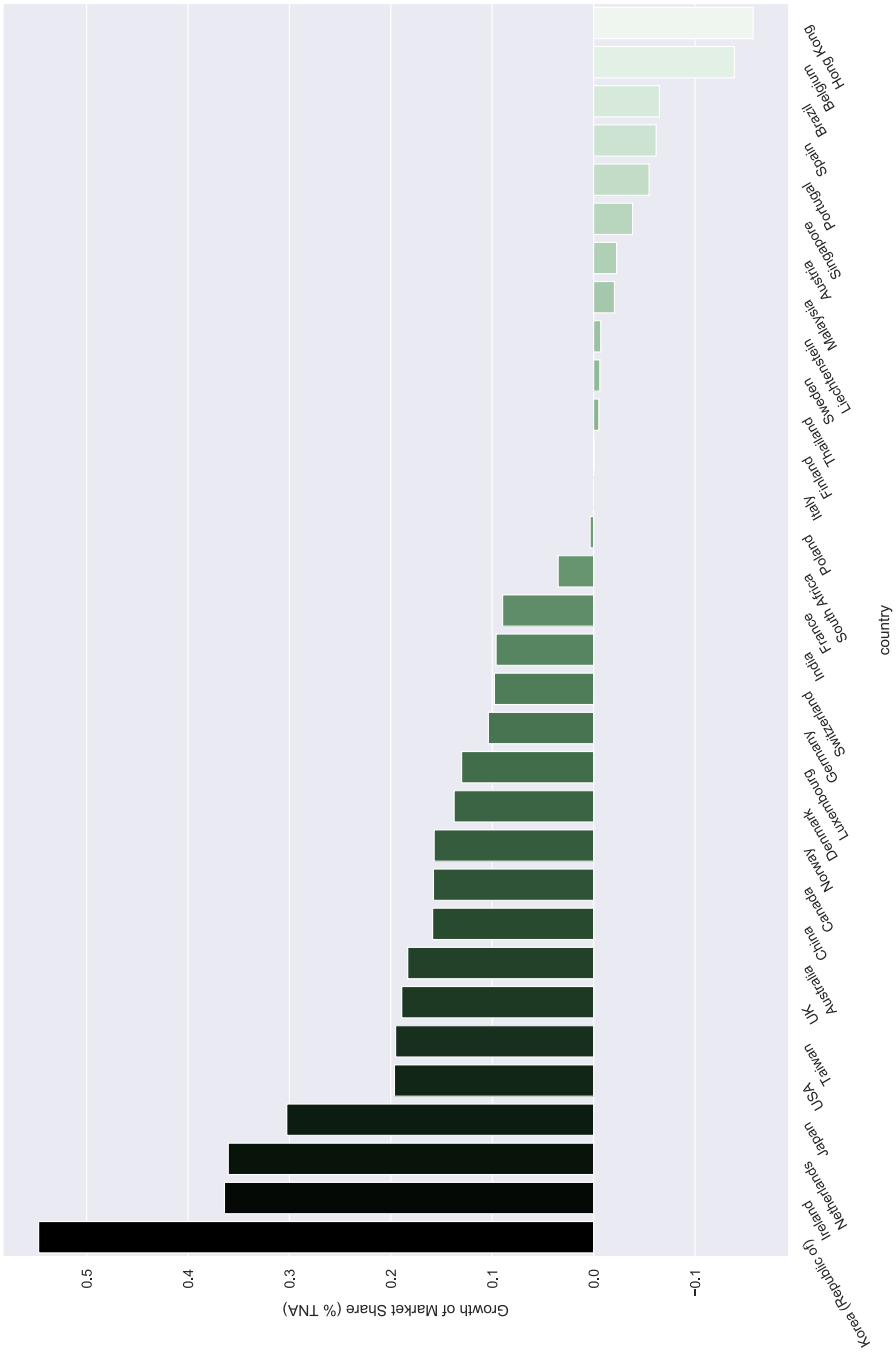

Fig. 3. Expansion of market share of indexed mutual funds and ETFs between 2008 and 2018. This figure shows the expansion of market share of indexed mutual funds and ETFs as a percentage of TNA, measured against the fund's country TNA from 2008 to 2018 by country of domicile of the fund.

Table 2
Indexed and active open-end equity mutual funds and ETFs by country of domicile and country of sale, as of December 2018.

	Active funds				Indexed funds			
Panel A: Statistics by Country of Domicile								
Country	Number	TNA	Market Share	TER	Number	TNA	Market Share	TER
Australia	1032	120.37	66.50%	1.16%	206	60.63	33.50%	0.27%
Austria	228	8.73	98.53%	1.31%	4	0.13	1.47%	1.16%
Belgium	260	23.02	89.78%	1.33%	18	2.62	10.22%	0.65%
Brazil	1664	70.87	92.93%	0.48%	68	5.39	7.07%	0.41%
Canada	1250	235.30	74.76%	1.90%	428	79.42	25.24%	0.34%
China	312	29.24	27.78%	1.51%	522	76.01	72.22%	0.60%
Denmark	236	27.96	79.47%	1.36%	15.00	7.22	20.53%	1.23%
Finland	184	38.36	94.10%	1.38%	17	2.41	5.90%	0.64%
France	1082	130.89	78.58%	0.78%	118	35.68	21.42%	0.15%
Germany	378	114.31	71.34%	1.39%	83	45.92	28.66%	0.29%
Hong Kong	172	41.51	60.77%	0.99%	65	26.79	39.23%	0.31%
India	420	96.64	85.82%	2.42%	86	15.97	14.18%	0.15%
Ireland	1031	148.35	35.27%	1.09%	599	272.24	64.73%	0.24%
Italy	78	14.78	100.00%	1.96%	–	0	0.00%	0.00%
Japan	1810	197.39	38.01%	1.40%	492	321.86	61.99%	0.17%
South Korea	1034	14.57	36.88%	1.46%	286	24.93	63.12%	0.21%
Liechtenstein	165	8.37	97.81%	1.20%	1	0.19	2.19%	0.01%
Luxembourg	3249	425.68	80.93%	1.37%	505	100.29	19.07%	0.32%
Malaysia	321	21.20	99.29%	1.60%	14	0.15	0.71%	0.67%
Netherlands	99	28.21	63.58%	0.64%	37	16.16	36.42%	0.11%
Norway	147	47.84	72.78%	0.88%	27	17.89	27.22%	0.29%
Poland	148	5.77	99.51%	1.41%	3	0.028	0.49%	2.28%
Portugal	42	1.59	97.57%	1.78%	2	0.04	2.43%	2.18%
Singapore	107	10.63	91.47%	1.67%	10	0.99	8.53%	0.50%
South Africa	88	5.99	78.80%	1.69%	28	1.61	21.20%	0.72%
Spain	289	43.00	89.08%	1.82%	33	5.27	10.92%	1.28%
Sweden	277	149.90	90.05%	0.83%	38	16.55	9.95%	0.99%
Switzerland	376	42.96	45.98%	0.61%	127	50.48	54.02%	0.09%
Taiwan	326	13.40	68.97%	2.62%	63	6.03	31.03%	0.82%
Thailand	418	25.22	91.87%	1.71%	77	2.23	8.13%	0.85%
UK	1041	359.88	69.60%	1.33%	125	157.17	30.40%	0.24%
USA	2420	2622.95	51.03%	0.66%	1273	2517.33	48.97%	0.15%
Total	20,684	5124.90	56.98%	0.99%	5370	3869.66	43.02%	0.19%
Panel B: Statistics by Country of Sale								
Country	Number	TNA	Market Share	TER	Number	TNA	Market Share	TER
Australia	1197	121.40	23.26%	1.17%	208	400.56	76.74%	0.22%
Austria	2369	514.35	55.49%	1.72%	710	412.51	44.51%	0.26%
Belgium	1505	719.44	84.74%	1.93%	170	129.60	15.26%	0.30%
Brazil	1451	70.87	92.93%	0.79%	66	5.39	7.07%	0.56%
Canada	1368	236.33	74.02%	2.01%	376	82.97	25.98%	0.37%
China	275	30.59	28.66%	1.51%	460	76.14	71.34%	0.63%
Denmark	1109	319.91	53.20%	1.69%	354	281.38	46.80%	0.32%
Finland	1613	428.16	57.72%	1.71%	503	313.63	42.28%	0.25%
France	3294	578.47	57.95%	1.74%	797	419.83	42.05%	0.26%
Germany	3360	668.61	60.92%	1.65%	866	428.85	39.08%	0.26%
Hong Kong	811	262.57	88.35%	1.77%	93	34.62	11.65%	0.77%
India	370	96.64	85.82%	2.42%	72	15.97	14.18%	0.15%
Ireland	1580	358.15	55.50%	1.64%	542	287.18	44.50%	0.25%
Italy	1826	421.08	56.05%	1.79%	544	330.13	43.95%	0.26%
Japan	1781	216.47	23.67%	1.39%	458	698.06	76.33%	0.14%
South Korea	1205	135.41	84.45%	1.85%	222	24.93	15.55%	0.21%
Liechtenstein	479	109.79	57.63%	1.96%	128	80.71	42.37%	0.20%
Luxembourg	3455	568.34	60.81%	1.69%	615	366.26	39.19%	0.25%
Malaysia	303	21.20	99.28%	1.61%	13	0.15	0.72%	0.69%
Netherlands	1631	421.79	51.39%	1.66%	659	398.94	48.61%	0.26%
Norway	1348	383.13	58.59%	1.70%	369	270.73	41.41%	0.24%
Poland	412	125.67	95.88%	1.87%	10	5.39	4.12%	0.37%
Portugal	742	245.63	58.51%	1.87%	175	174.19	41.49%	0.24%
Singapore	1413	373.07	33.69%	1.80%	219	734.39	66.31%	0.21%
South Africa	222	72.02	66.39%	1.82%	38	36.46	33.61%	0.16%
Spain	2049	889.96	69.36%	1.94%	629	393.07	30.64%	0.29%
Sweden	1878	536.49	59.55%	1.50%	629	364.34	40.45%	0.36%

(*continued on next page*)

Table 2 (*continued*)

Panel B: Statistics by Country of Sale								
Country	Number	TNA	Market Share	TER	Number	TNA	Market Share	TER
Switzerland	2871	579.39	57.23%	1.64%	306	433.07	42.77%	0.25%
Taiwan	839	245.67	97.55%	1.74%	52	6.16	2.45%	0.81%
Thailand	374	25.22	91.87%	1.75%	74	2.23	8.13%	0.86%
UK	3181	825.40	54.85%	1.50%	982	679.46	45.15%	0.28%
USA	2384	2624.15	51.03%	0.67%	1129	2517.88	48.97%	0.17%
Total	48,695	13,225.37	55.97%	1.51%	12,468	10,405.18	44.03%	0.24%

Notes: TNA is given in billions of US dollars, market share as a percentage of TNA (% of TNA). Average total expense ratios (TERs) are TNA-weighted.

underscoring the importance of ETFs to this growth. In our sample, ETFs, which represented only 29% of TNA invested in indexed funds in 2002, accounted for more than 66% of these assets in 2018.

Fig. 3 depicts the extent of expansion of indexed funds in various countries of domicile in the sample between 2008 and 2018. South Korea saw their market share increase by almost 55%; there were smaller increases in Ireland, the Netherlands, Japan, the United States, and Taiwan.

In contrast, indexed fund market share fell in Hong Kong, Belgium, Brazil, Spain, Portugal, Singapore, Austria, Malaysia, Liechtenstein, Sweden, Thailand, and Finland, although by less than 16%. In Brazil, ETFs were not widespread among retail investors, and banks and brokers devoted minimal effort to selling them (Yoshinaga & Eid, 2019). In Europe, according to PwC (2019), the passive fund market received a boost from early implementation by Germany, Switzerland, the Netherlands, and the United Kingdom of the Markets in Financial Instruments Directive II (MiFID II), which aimed to increase transparency in financial markets.

Table 2 presents the number of funds, TNA in billions of dollars, market share as a percentage of TNA, and TNA-weighted average

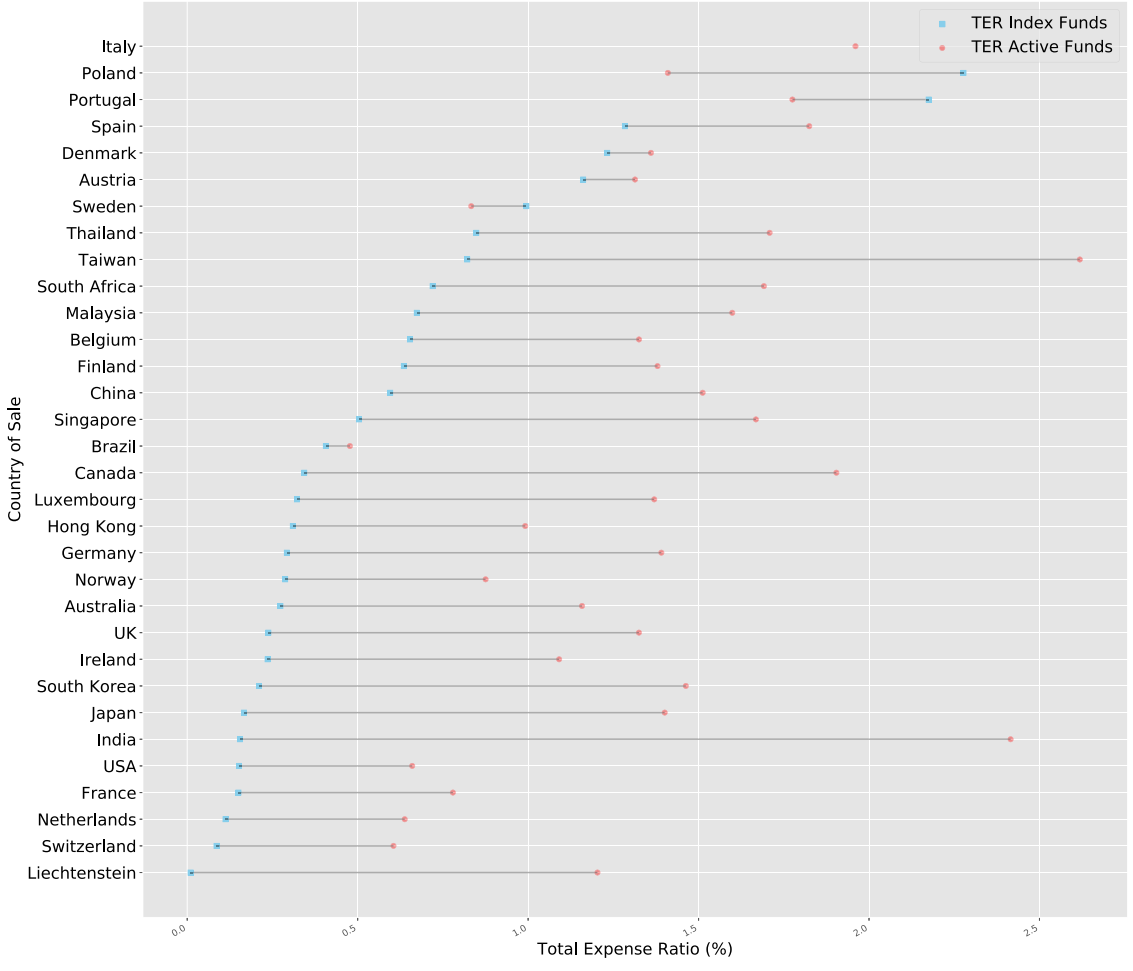

Fig. 4. TNA-weighted TER by country of domicile for active and indexed funds, as of December 2018.

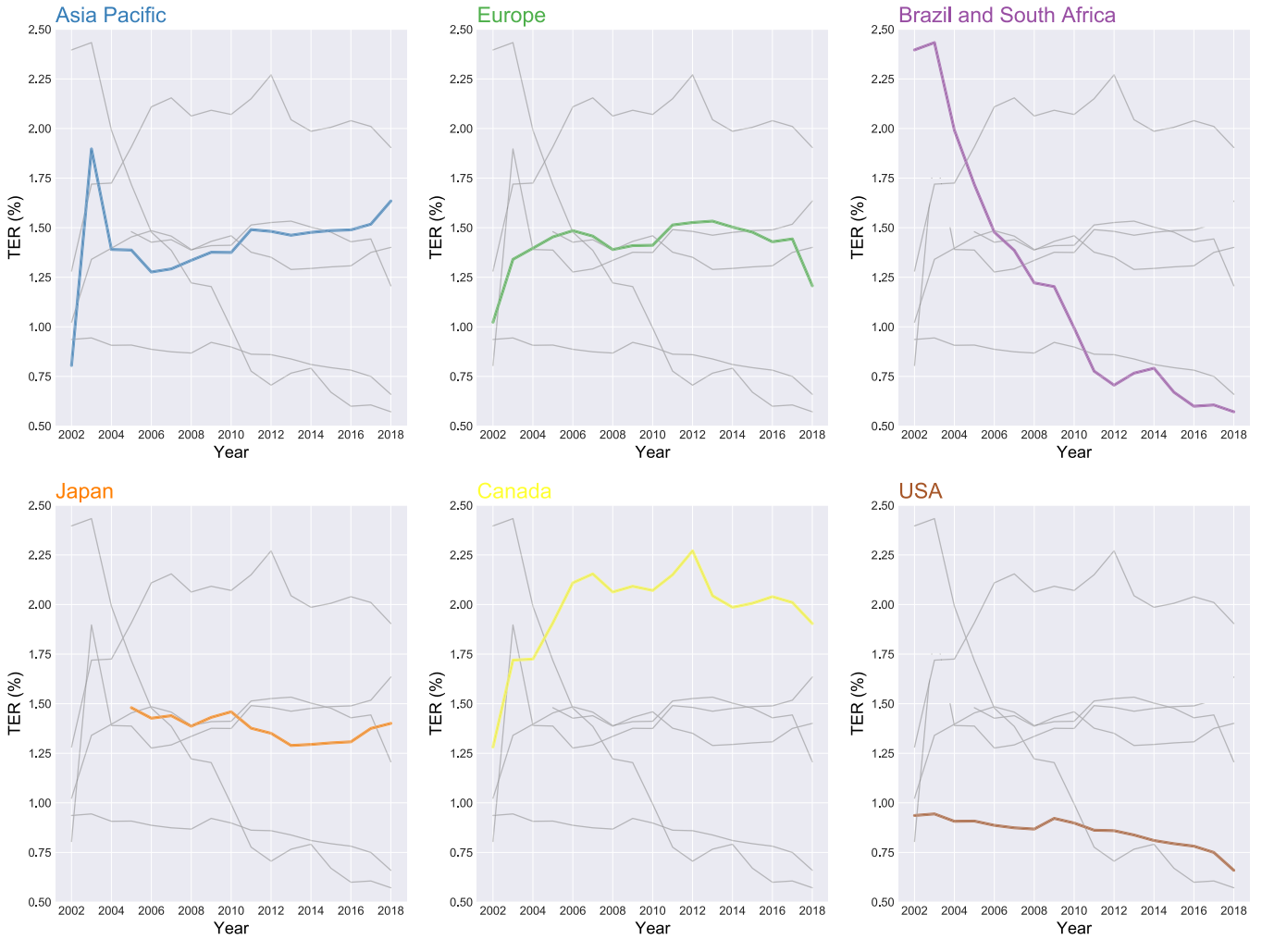

Fig. 5. TNA-weighted TER by year for active funds from 2002 to 2018, by region of domicile.

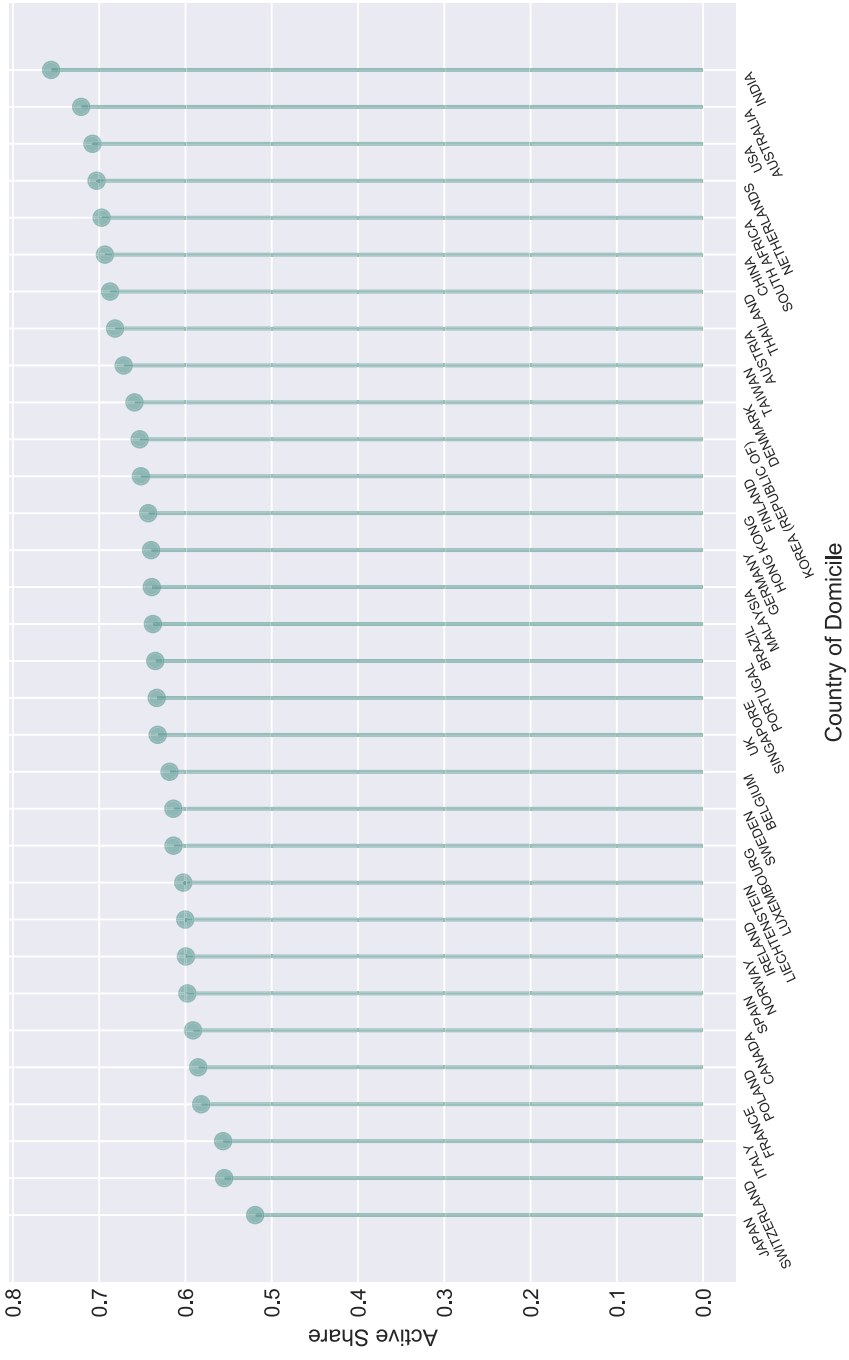

Fig. 6. Average percentage of active share for active funds by country of domicile, from 2008 to 2018.

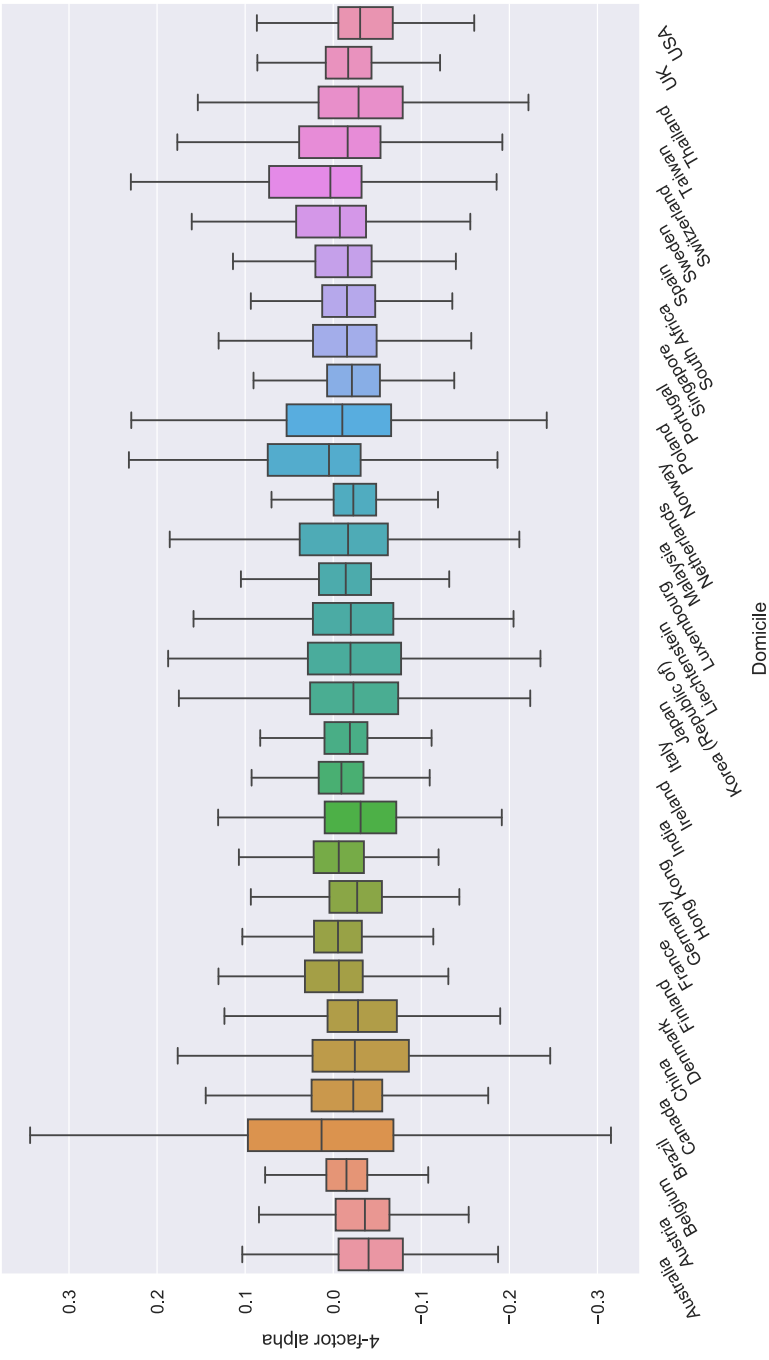

Fig. 7. Boxplots of alpha distributions for active funds by country of domicile, from 2008 to 2018.

TERs by country of domicile and sale for the sample of indexed and active funds as of December 2018. This table reveals a remarkable variation in indexed funds' market shares: among countries of domicile, China has more than 72% of its TNA in indexed funds, while Italy has none; and among countries of sale Australia and Japan have more than 76% of TNA in indexed funds, while Brazil, Malaysia, Poland, Thailand, and Taiwan have less than 10%.

3.2. Total expense ratio

Panel A of Table 2 also shows disparities in TERs between indexed and active funds. Grouped by country of domicile, active mutual funds had a TNA-weighted expense ratio of approximately 1%, while indexed funds had a ratio of only about 0.20%—further evidence that indexed funds provide a low-cost alternative for investors to trade on the stock market. Fig. 4 reveals that TERs varied widely across countries among both active and indexed funds. While active funds from Brazil, Switzerland, the Netherlands, and the United States cost less than 0.7% per year at the end of 2018, in countries such as Taiwan, India, and Italy their fees exceeded 1.90% per year. For indexed funds, TNA-weighted expense ratios were lowest for Liechtenstein, Switzerland, the Netherlands, the United States, and France, at less than 0.15% per annum, while in Poland and Portugal the charges were more than 2% per annum.

Fig. 5 demonstrates the evolution of TNA-weighted TERs over time for active funds in the sample by region of domicile. Fees did not vary much between 2008 and 2018 in most regions except Brazil and South Africa, where they declined steeply. Indexed funds do not have a high market share in either country, suggesting that the plunging fees of active funds are unrelated to expanded indexing ratios.

3.3. Active share

The active share, calculated according to the model proposed by Amihud and Goyenko (2013), also varies significantly by country, as Fig. 6 shows. Among countries of domicile, India, Australia, the United States, and the Netherlands exhibit high average percentages of activity between 2008 and 2018, while Japan, Switzerland, and Italy exhibit the lowest average values.

3.4. Fund returns

Table 1 summarizes the returns earned by active funds and shows that the average and median of benchmark-adjusted returns and alphas are negative. Specifically, half of the sample funds generated alphas equal to or less than -2%. Fig. 7 provides boxplots of distributions of alpha for various countries. It shows that among countries of domicile only Brazil, Norway, and Switzerland have median excess returns greater than 0%, with Brazil having the largest dispersion in the distribution of excess returns.

4. Results

4.1. Determinants of indexed funds' market share and total expense ratios across countries

Table 3 shows significant variations in the market share of indexed funds across countries, which could result from judicial and regulatory systems and the economic conditions affecting each country's mutual fund industry. Columns 1 and 3 show the results of Equation (4), in which the dependent variable is the market share of indexed funds in each country in a given year; columns 2 and 4 show the outcomes of Equation (5), in which the dependent variable is the TNA-weighted TER of indexed funds in each country in a given year.

Our findings indicate, in accord with Cremers et al. (2016), that larger fund industries have higher market shares of indexed products. This result is even more pronounced for the sample by country of sale of funds, in which a 1% increase in the size of the mutual fund industry is associated with an increase of 0.15% in passive funds' market share. In addition, the costs of such products are significantly lower in countries with larger fund industries. In the samples both by country of sale and by domicile, a 1% expansion in mutual fund industry size causes fee reductions of approximately 0.16% and 0.18%, respectively.

Our results corroborate studies that associate more effective judicial systems with higher levels of financial development. Khorana et al. (2005) linked more effective legal environments with greater penetration of transparent investment products, such as ETFs. For our sample by country of domicile, in more advanced judicial environments indexed funds are more available and charge lower fees. But when we analyze the sample by country of sale, we obtain the opposite result for fees. A possible explanation is that, as Khorana et al. (2008) note, fees are commonly higher for funds offered for sale in a particular country than for funds sold and domiciled in the same country.

However, unlike Cremers et al. (2016), we find that the extent to which regulatory approvals are required to establish a fund does not increase the availability or costs of indexed funds. Indeed, countries that demand more regulatory approvals seem to offer fewer indexed products at higher costs. One possible reason is that management companies may have to spend more to comply with broader legal restrictions. Moreover, economic development in terms of GDP per capita does not seem to be important to the market share of passive funds. An increase in GDP per capita even decreases the indexing ratio, perhaps because passive products have grown extensively in Asian countries with lower GDP per capita, such as South Korea, Taiwan, and China.

Older active fund industries represent a significant barrier to the entrance of passive investments; a one-year increment in the average age of active funds by country of sale is associated with a 0.062% reduction in passive funds' market share. In the sample by country of domicile, a one-year increase in the average age of active funds is associated with 0.03% reduction in passive funds' market share and an increase of approximately 0.045% in their fees. Finally, mutual fund industry concentration increases the availability of

Table 3
Determinants of market share and total expense ratios of indexed funds, 2008–2018.

	Dependent variable:			
	Indexing ratio	Indexed funds' TER	Indexing ratio	Indexed funds' TER
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Fund industry size (log)	0.1500***	−0.1600***	0.0360***	−0.1800***
	(0.0150)	(0.0180)	(0.0046)	(0.0170)
GDP per capita (log)	−0.0520***	−0.0360	−0.0440***	0.1300***
	(0.0180)	(0.0250)	(0.0160)	(0.0490)
Fund industry Herfindahl	0.0001***	−0.0001***	−0.00003***	−0.00001
	(0.00001)	(0.00001)	(0.00001)	(0.00002)
Judicial	0.0066***	0.0078***	0.0120***	−0.0250***
	(0.0011)	(0.0016)	(0.0019)	(0.0062)
Approval	−0.0160	0.0710***	−0.0710***	0.0180
	(0.0160)	(0.0170)	(0.0170)	(0.0420)
Active funds' average age	−0.0620***	0.0100	−0.0310***	0.0450***
	(0.0066)	(0.0076)	(0.0033)	(0.0110)
Observations	344	344	344	333
R^2	0.5300	0.5500	0.3900	0.3800
Adjusted R^2	0.5100	0.5300	0.3600	0.3400

Notes: This table presents estimates of annual country-level regressions in which the dependent variable is, in columns 1 and 3, the percentage market share, in terms of TNA, of indexed funds in the country's equity mutual fund industry in a given year. For columns 2 and 4, the dependent variable is the TNA-weighted total expense ratio of indexed funds in each country in a given year. In columns 1 and 2, the observation unit is a country of sale *c* in year *y*, while in columns 3 and 4, the observation unit is a country of domicile *d* in year *y*. Regressions include year dummies and robust standard errors, reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

passive funds, as Cremers et al. (2016) also found, and decreases their fees. For the sample by country of sale, an increase of 1,000 points in the fund industry's Herfindahl index is associated with an increase of 0.1% in the market share of passive funds and a reduction of 0.1% in their fees. In contrast, for the sample by country of domicile, industry concentrations do not have economic relevance to the market share of passive funds despite being statistically significant.

4.2. Determinants of active management product differentiation

Has the increased competition from indexed funds led active funds to enhance their product differentiation? Table 4 shows the estimates of a panel regression in which the dependent variable is the active share of an active fund at the end of each year, calculated according to Amihud and Goyenko (2013). Columns 1 and 3 show the results of Equation (6), examining the association between active funds' activity and the market share of passive funds in each country (indexing ratio); columns 2 and 4 show the results of Equation (7), investigating the relationship between such activity and the TNA-weighted TERs of indexed funds in each country (indexed funds TER).

When we consider the sample by country of domicile, our results indicate that a 1% increase in passive funds' market share produces an approximately 0.1% decrease in the active share of active funds. These findings hold when the active share is measured according to the CAPM (see Table I.1 in Appendix I); for a sample of non-US-domiciled funds (see Table E.1 in Appendix E); for a sample of funds domiciled or sold only in the United States (see Table F.1 in Appendix F); for a sample of countries with more than 20 passive funds domiciled or being sold (see Table G.1 in Appendix G); and for a sample including only non-US-domiciled funds that account for more than 0.75% of the TNA of the full sample (see Table H.1 in Appendix H).

Cremers et al. (2016) found that managers of active funds perceived low-cost indexed funds as a competitive threat, and this result suggests that they responded by increasing their active share. However, the authors' results were significant only for a sample by country of sale. We obtained similar outcomes when we ran the tests with our precrisis sample, suggesting that when the competitive pressure of indexed funds was not as strong, active funds increased their active shares to compete with indexed funds via differentiation. These results are reported in Table D.1 in Appendix D. Subsequently, as the prevalence of passive funds increased, active funds did not seek greater differentiation, and even reduced their activity.

Overall, our results bolster the concerns of Wurgler (2011) that the growing market share of indexed funds could discourage active fund managers from gathering information and cause them to reduce their funds' active shares so as to differ less from their benchmarks. Cremers et al. (2016) also pointed out that if mutual fund markets were segmented, active fund managers might care more about their performance relative to the benchmark indices and consequently hold in their portfolios more stocks that belonged to those benchmarks, to avoid underperforming them. The authors also indicated that an increase in the average fee of passive funds in a given country was associated with a decrease in the average active share of active funds. Our findings, in contrast, suggest that indexed fund fees are not statistically or economically significant in explaining the active share of actively managed funds.

A fund's family size plays a statistically significant role in explaining its active share: the higher the family's assets, the higher the fund's activity level (Kempf & Ruenzi, 2007). The size of the industry too is significant, in accord with the idea that the largest fund industries tend to be more competitive (Khorana et al., 2008), so that fund managers seek to differentiate their products more from

Table 4
Determinants of active share of actively managed mutual funds, 2008–2018.

	Dependent variable:			
	Active share	Active share	Active share	Active share
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.0120		−0.0860***	
	(0.0089)		(0.0098)	
Indexed funds TER		−0.0032		0.0110**
		(0.0045)		(0.0050)
Tracking error	−0.0350***	−0.0350***	−0.0720***	−0.0690***
	(0.0077)	(0.0077)	(0.0210)	(0.0210)
TER	−0.0110***	−0.0110***	−0.0054***	−0.0057***
	(0.0005)	(0.0005)	(0.0008)	(0.0008)
TNA (log)	−0.0043***	−0.0044***	−0.0010***	−0.0010***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Family TNA (log)	0.0022***	0.0022***	0.0012***	0.0011***
	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Age	0.0015***	0.0015***	0.0009***	0.0009***
	(0.00004)	(0.00004)	(0.0001)	(0.0001)
Flows	−0.000001***	−0.000001***	−0.000001***	−0.000001***
	(0.000000)	(0.000000)	(0.000000)	(0.000000)
Fund industry size (log)	0.0380***	0.0380***	0.0170***	0.0270***
	(0.0024)	(0.0025)	(0.0026)	(0.0026)
GDP per capita (log)	−0.0120*	−0.0130**	−0.00004	−0.0180*
	(0.0067)	(0.0066)	(0.0110)	(0.0110)
Fund industry Herfindahl	0.00001**	0.00001**	−0.00001***	−0.00002***
	(0.000003)	(0.000003)	(0.000003)	(0.000003)
Observations	320,249	320,249	110,293	109,503
R^2	0.3300	0.3300	0.3500	0.3600
Adjusted R^2	0.3300	0.3300	0.3500	0.3500

Notes: This table provides results of panel regressions in which the dependent variable across all models is the active share of a fund at the end of each year, calculated according to Amihud and Goyenko (2013). In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 present the results of the tests exploring the association between active funds' activity and the market share of passive funds in each country; columns 2 and 4 display the results of the tests examining the relationship between such activity and the TNA-weighted TERs of indexed funds in each country. All of the regressions include year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

their benchmarks. Furthermore, like Cremers and Petajisto (2009), we observe that smaller funds tend to be more active, larger ones less active. However, unlike Cremers and Petajisto (2009) and Cremers et al. (2016), we find that higher TERs are associated with lower active shares.

Finally, Cremers and Petajisto (2009) note that the essential difference between the active share and tracking error is that the latter incorporates the covariance matrix of returns and thus places a greater weight on correlated active bets; in contrast, the active share, which does not consider diversification, places equal weights on active bets. Thus a fund that emphasizes diversified stock picking can have a high active share despite having a low tracking error. In contrast, a fund investing in systematic factor bets can exhibit a considerable tracking error even without significant deviations from its index holdings. Consequently, the two measures could be negatively related. Consistently with this idea, we find that active funds with high tracking errors tend to have lower activity levels. Flows and the industry concentration level, despite being statistically significant, have economically negligible effects on the active share, while older active funds tend to be more active than their younger peers.

4.3. Determinants of the total expense ratios of active funds

Wahal and Wang (2011) noted that fund managers could exploit less competitive environments. The researchers found evidence that funds facing higher competition experienced smaller inflows and reduced their management fees. However, the rising distribution costs faced by these funds indicated that there were few benefits for consumers. Similarly, Cremers et al. (2016) point out that the expanded availability of indexed funds is associated with lower fees charged by active funds. This result implies that investors pay a higher fee for active funds in markets where indexed products exert less competitive pressure. We test this hypothesis and obtain results shown in Table 5, in which the dependent variable is a three-year moving average of the TER of an active fund at the end of each year. Columns 1 and 3 present the results of Equation (8), investigating the association between active funds' fees and the market share of indexed funds in each country (indexing ratio); columns 2 and 4 present the results of Equation (9), analyzing the relationship between these fees and the TNA-weighted TERs of passive funds in each country (indexed funds TER).

When we analyze the results by country of sale, the increasing availability of indexed funds does not significantly affect the TERs of active funds. And when we consider the sample by country of domicile, the expanded market share of passive products is even

Table 5
Determinants of the TER of an open-end active mutual fund, 2008–2018.

	Dependent variable:			
	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0500		0.4200***	
	(0.0410)		(0.0380)	
Indexed funds TER		0.0480***		0.1300***
		(0.0160)		(0.0230)
Active share	−0.1400***	−0.1400***	−0.1000***	−0.1100***
	(0.0059)	(0.0059)	(0.0110)	(0.0110)
Tracking error	0.2800***	0.2800***	0.2900***	0.2700***
	(0.0350)	(0.0350)	(0.0570)	(0.0550)
TNA (log)	−0.0270***	−0.0270***	−0.0390***	−0.0400***
	(0.0006)	(0.0006)	(0.0012)	(0.0012)
Family TNA (log)	−0.0140***	−0.0140***	−0.0400***	−0.0410***
	(0.0007)	(0.0007)	(0.0011)	(0.0011)
Age	0.0057***	0.0057***	0.0085***	0.0085***
	(0.0001)	(0.0001)	(0.0003)	(0.0003)
Flows	−0.000002***	−0.000002***	−0.000001***	−0.000001***
	(0.000000)	(0.000000)	(0.000000)	(0.000000)
Benchmark-adjusted return	−0.0400***	−0.0410***	0.0130	0.0170
	(0.0110)	(0.0110)	(0.0190)	(0.0200)
Fund industry size (log)	0.0089	0.0160	−0.0410***	−0.0410***
	(0.0099)	(0.0100)	(0.0110)	(0.0110)
GDP per capita (log)	0.1500***	0.1600***	0.2300***	0.3800***
	(0.0230)	(0.0220)	(0.0450)	(0.0460)
Fund industry Herfindahl	0.000000	−0.00001	−0.0001***	−0.0001***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Observations	305,018	305,018	105,549	104,759
R^2	0.2500	0.2500	0.4000	0.4000
Adjusted R^2	0.2500	0.2500	0.4000	0.4000

Notes: This table provides results of panel regressions in which the dependent variable across all models is a three-year moving average of the TER of a fund at the end of the year. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the results of the tests studying the association between active funds' fees and the market share of indexed funds in each country; columns 2 and 4 display the results of the tests analyzing the relationship between these fees and the TNA-weighted TERs of passive funds in each country. All regressions include year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

associated with higher TERs of actively managed funds. This result is statistically and economically significant: a 1% gain in the market share of indexed funds generates an approximately 0.42% increase in TERs. These results hold when active share is measured using the CAPM (see Table I.2); for a sample that excludes US-domiciled funds (see Table E.2 in Appendix E); for a sample of funds domiciled or sold only in the United States (see Table F.2 in Appendix F); for a sample including only countries with more than 20 passive funds domiciled or being sold (see Table G.2 in Appendix G); and for a sample including only non-US-domiciled funds that account for more than 0.75% of the TNA of the full sample (see Table H.2 in Appendix H).

These findings again contradict those of Cremers et al. (2016). However, if we consider our precrisis sample, we obtain results similar to those of Cremers et al., indicating that initially, when the competitive pressure imposed by passive investments was not as compelling, active funds attempted to reduce their fees. These results are reported in Table D.2 in Appendix D. Nevertheless, after the crisis, the decline in the market share of active funds due to the more prominent presence of indexed products led active funds to increase their fees. Cremers et al. (2016) argued that active funds facing more competitive pressure from indexed products could end up having to raise their fees because of higher marketing expenses. Khorana et al. (2008) emphasized that fees tended to be lower for larger funds, reflecting economies of scale, and we can infer that market share losses by active funds may have made these products less economically efficient and therefore raised their fees. Our findings are consistent with both arguments.

Our results indicate the existence of demand-side market segmentation among buyer classes with different price sensitivities, similar to that observed in several studies of the generic drug market (Frank & Salkever, 1997; Regan, 2008; Vandoros & Kanavos, 2013). We argue that the same phenomenon has occurred in the mutual fund industry. Hoberg, Kumar, and Prabhala (2017) observed that in contrast to indexed funds, for which competitors could easily be identified, actively managed products' rivals could not be straightforwardly determined since these funds differed in style. Hortaçsu and Syverson (2004) argued that investors had heterogeneous preferences for services, such as account services (e.g., frequency and quality of account statements, and customer service by phone or e-mail), and different search costs of investments since funds were valued in distinct manners. Thus, asset management companies could charge higher fees for active funds without offering product differentiation in terms of active share and still retain price-insensitive customers.

In addition, high TNA-weighted TERs of indexed funds are also associated with greater TERs of active funds. This fact reflects a possible tendency of countries with low passive fund fees to also have less expensive active funds. We also find evidence that active mutual fund fees decrease as their TNA increases, indicating that as fund sizes increase, funds expect to achieve economies of scale because some costs are fixed (Elton, Gruber, & Blake, 2012; Gil-Bazo & Ruiz-Verdú, 2009). Additionally, we observe that fees also decrease as the size of funds within the same family rises (Khorana et al., 2008).

Finally, we find that increases in the tracking error (Cremers et al., 2016) and the age of a fund (Cremers et al., 2016; Khorana et al., 2008) are associated with higher fees. However, unlike Cremers et al. (2016), we find that an increase in the active share reduces the expense ratios. This finding could indicate that active funds that avoided reducing their activity under competitive pressure from passive funds ended up not attaining a superior performance, and decreased their management fees in order to avoid a loss of assets under management. Another important point is that high levels of GDP per capita are linked to greater TERs (Cremers et al., 2016). In addition, the higher the mutual fund industry's concentration is, the lower the active funds' fees. Overall, the results thus far indicate that intensified competition from passive funds has not caused active funds to compete via product differentiation or price.

4.4. Determinants of the performance of active funds

Ultimately, we test here whether investors can derive any benefit from the change in the fund industry caused by the expanding availability of indexed funds. We attempt to identify whether the changes in a fund's active share and the indexing ratio in a fund's country could affect the fund's performance. Several papers have presented evidence suggesting that funds with higher active shares perform better worldwide (Cremers et al., 2016) and in the United States (Cremers & Petajisto, 2009).

Table 6 shows the estimates of fund-level panel data regressions in which the dependent variable is the benchmark-adjusted four-factor alpha of an active fund at the end of each year. The variables of interest are the market share and TNA-weighted TERs of indexed funds in each country, and a fund's active share and its tracking error at the end of each year. Columns 1 and 3 present the results of Equation 10, investigating the association between active funds' alpha and the market share of passive products in each country

Table 6
Determinants of the performance of open-end active mutual funds, 2008–2018.

	Dependent variable:			
	Four-factor alpha	Four-factor alpha	Four-factor alpha	Four-factor alpha
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.1500***		0.1700***	
	(0.0060)		(0.0110)	
Indexed funds TER		0.0046		0.0110***
		(0.0030)		(0.0040)
Active share	−0.0079***	−0.0079***	−0.0370***	−0.0390***
	(0.0014)	(0.0014)	(0.0029)	(0.0029)
Tracking error	0.7400***	0.7400***	0.2100	0.2000
	(0.0380)	(0.0380)	(0.1600)	(0.1600)
TER	−0.0072***	−0.0073***	−0.0036***	−0.0034***
	(0.0004)	(0.0004)	(0.0006)	(0.0006)
TNA (log)	0.0019***	0.0019***	0.0019***	0.0016***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Family TNA (log)	0.0021***	0.0020***	0.0007**	0.0008***
	(0.0001)	(0.0001)	(0.0003)	(0.0003)
Age	−0.0003***	−0.0003***	−0.0002***	−0.0002***
	(0.00002)	(0.00002)	(0.00003)	(0.00003)
Flows	0.000000	0.000000	−0.000000	−0.000000
	(0.000000)	(0.000000)	(0.000000)	(0.000000)
Fund industry size (log)	−0.0066***	−0.0084***	0.0044*	0.0020
	(0.0018)	(0.0019)	(0.0025)	(0.0029)
GDP per capita (log)	0.0450***	0.0250***	−0.0190	0.0400**
	(0.0045)	(0.0043)	(0.0140)	(0.0170)
Fund industry Herfindahl	−0.00004***	−0.00002***	−0.00003***	−0.00003***
	(0.000002)	(0.000002)	(0.000003)	(0.000003)
Observations	320,249	320,249	110,293	109,503
R^2	0.4500	0.4500	0.1900	0.1800
Adjusted R^2	0.4500	0.4500	0.1900	0.1800

Notes: This table provides results of panel regressions in which the dependent variable across all models is the four-factor alpha of an active fund's benchmark-adjusted returns at the end of each year. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the outcomes of the tests examining the association between active funds' alpha and the market share of passive products in each country; columns 2 and 4 present the results of the tests investigating the relationship between these active funds' alpha and the TNA-weighted TERs of indexed funds in each country. All of the regressions include year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

(indexing ratio); columns 2 and 4 present those of Equation 11, exploring the relationship between these active funds' alpha and the TNA-weighted TERs of indexed funds in each country (indexed funds TER).

Our findings suggest that an increase in funds' active shares significantly reduces their alphas. This result is statistically and economically significant, with a 1% rise in the active share causing a 0.037% decline of alphas generated by these funds if we consider our sample by country of domicile. These results are also robust to using CAPM (see Table I.3 in Appendix I); to considering only non-US-domiciled funds (see Table E.3 in Appendix E); to considering only funds domiciled or sold only in the United States (see Table F.3 in Appendix F); to considering only countries with more than 20 passive funds domiciled or being sold (see Table G.3 in Appendix G); and to considering only non-US-domiciled funds that account for more than 0.75% of the TNA of the full sample (see Table H.3 in Appendix H).

These outcomes contradict the findings of Cremers et al. (2016). Our precrisis sample indicates that initially, as Cremers et al. (2016) also found, higher active shares were associated with higher alphas; however, we observe that an increase in the market shares of indexed funds is linked to lower active fund alphas (see Table D.3 in Appendix D). After the financial crisis, with more competitive pressure exerted by passive funds, their expanded market share improved the performance of active equity funds—perhaps because the increasing availability of indexed products eventually decreased funds' activity, so fund managers who hewed closer to the benchmark performed better. These results are consistent with other studies that have pointed out that active funds fail to generate excess returns; thus, investors should purchase low-cost indexed products (French, 2008; Gruber, 1996; Malkiel, 1995). Cremers et al. (2016) also indicated that an increase in the average fees of passive funds in a country was associated with a decrease in the average alpha generated by active funds. Our findings, in contrast, suggest that the effects of indexed fund fees are negligible in explaining the alphas of actively managed funds.

In addition, Cremers et al. (2016) found that a fund's tracking error was negatively related to its future performance, indicating that the market rewarded the most active funds for stock picking but did not reward factorial bets. In contrast, our results indicate that the more volatile benchmark-adjusted returns are, the greater are the excess returns produced by active funds. This outcome indicates that systematic factor bets can yield higher performance than stock-picking. Wermers and Robert (2003) also found a positive relationship between the tracking error of funds and their alphas and concluded that active management could provide value—but only in the minority of funds that make large volatility bets.

We observe that the larger a fund's TNA is, the better its performance. This relationship has been quite controversial in the literature. Several papers have suggested a positive relationship between fund size and performance (Bhojraj, Cho, & Yehuda, 2012; Elton et al., 2012) due to (1) a reduction in expenses that outweighs the possible diseconomies of scale that arise when funds grow, and (2) a possible positive relationship between fund size and access to private information. Our results also indicate that young funds outperform older ones (Pástor, Stambaugh, & Taylor, 2015). In contrast to Ferreira et al. (2013), we also find evidence that a country's level of economic development as measured by GDP per capita is positively associated with fund performance. Finally, an increase in industry concentration decreases funds' excess returns, indicating that less concentrated markets foster competition and can better remunerate investors.

5. Conclusions

We tested whether escalating competition from indexed equity funds led active funds to reduce their fees or increase their active share. Our results indicate that investors do not regard these funds as substitutes, and that the expanded availability of low-cost indexed products had neither of these consequences—indeed, active funds facing increasing competition from indexed products sometimes raised their fees and decreased their active shares. These results suggest that investors' demand for investment funds has a price-insensitive segment, and that asset management companies could create passive funds that would capture cross-price-sensitive clients while continuing to retain customers insensitive to price within their actively managed funds' platform.

Despite market segmentation, our results indicate that the increasing availability of indexed funds benefited investors in general. There was pent-up demand for this type of product from price-sensitive investors. Meanwhile, even though price-insensitive investors saw the active share of their active funds decrease, they have benefited because, on average, the alphas generated by active funds are negative. By deviating less from funds' benchmarks, managers achieved better performance than before. Finally, we attempted to clarify the possible effects of the increase in passive funds on the investment fund industry, but its consequences for financial stability are not yet clear, generating topics for future research.

Declaration of Competing Interest

None.

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Appendix A. Distribution of market share and number of funds by geographic focus

Table A.1
Distribution of market share and number of funds by geographic focus, as of December 2018.

Geographic focus	Geographic area	Total net assets	Market share	Number of funds
World	World	2876.08	31.89%	8372
Regional	Europe	455.53	5.05%	2544
Regional	Asia	163.58	1.81%	1105
Regional	North America	50.88	0.56%	204
Regional	Emerging Markets	14.22	0.16%	164
Regional	Middle East & Africa	3.01	0.03%	78
Country	United States of America	3717.88	41.23%	3579
Country	Japan	468.30	5.19%	1502
Country	United Kingdom	237.11	2.63%	478
Country	China	153.36	1.70%	1207
Country	India	149.43	1.66%	660
Country	Canada	144.01	1.60%	541
Country	Brazil	86.55	0.96%	1770
Country	Australia	79.99	0.89%	592
Country	Germany	57.99	0.64%	143
Country	Sweden	50.26	0.56%	96
Country	Switzerland	43.65	0.48%	300
Country	France	40.13	0.45%	220
Country	Korea	37.30	0.41%	752
Country	Hong Kong	34.21	0.38%	74
Country	China	25.81	0.29%	211
Country	Thailand	22.38	0.25%	279
Country	Norway	16.93	0.19%	65
Country	Malaysia	14.17	0.16%	172
Country	Spain	13.04	0.14%	75
Country	Taiwan	12.71	0.14%	179
Country	Russia	7.10	0.08%	70
Country	Italy	6.52	0.07%	64
Country	Finland	5.68	0.06%	37
Country	Netherlands	5.06	0.06%	18
Country	Vietnam	4.49	0.05%	52
Country	Poland	3.31	0.04%	64
Country	Denmark	3.12	0.03%	33
Country	Singapore	3.04	0.03%	24
Country	Indonesia	1.99	0.02%	33
Country	Austria	1.30	0.01%	16
Country	Mexico	1.29	0.01%	16
Country	Belgium	1.29	0.01%	20
Country	South Africa	1.20	0.01%	25
Country	Turkey	0.51	0.01%	1
Country	Chile	0.46	0.01%	1
Country	Philippines	0.42	0.00%	10
Country	Greece	0.40	0.00%	3
Country	Saudi Arabia	0.37	0.00%	5
Country	Israel	0.33	0.00%	9
Country	Portugal	0.26	0.00%	8
Country	New Zealand	0.20	0.00%	4
Country	Peru	0.15	0.00%	1
Country	Argentina	0.10	0.00%	2
Country	Pakistan	0.09	0.00%	3
Country	United Arab Emirates	0.08	0.00%	6
Country	Ireland	0.08	0.00%	4
Country	Czech Republic	0.08	0.00%	1
Country	Qatar	0.06	0.00%	1
Country	Egypt	0.03	0.00%	1
Country	Romania	0.02	0.00%	2
Country	Morocco	0.02	0.00%	2
Country	Bulgaria	0.00	0.00%	1

Note: The sample includes open-end equity mutual funds and ETFs. TNA is given in billions of US dollars, market share as a percentage of TNA (% of TNA).

Appendix B. Time series averages of country-level variables by country of domicile

Table B.1
Averages of country-level variables by country of domicile, 2008–2018.

Domicile	Fund Ind. Size	Index. ratio	Index funds' TER	Fund ind. Her-findahl	GDP p.c	Approval	Judicial	Active funds' age
Australia	158.19	0.24	0.26	547.2	53,983.96	2	47	9.76
Austria	9.1	0.02	1.2	1400.98	48,055.27	2	47	12.27
Belgium	12.87	0.14	0.81	3572.44	44,957.05	2	47	10.55
Brazil	45.72	0.08	0.65	1223.78	11,236.69	2	32	6.01
Canada	266.62	0.15	0.41	731.35	49,331.76	1	48	11.7
China	81.13	0.73	0.71	754.25	5738.21	1	31	4.46
Denmark	32.48	0.12	1.46	859.26	59,825.76	1	49	11.49
Finland	28.9	0.04	0.68	2361.27	46,629.96	1	49	10
France	146.44	0.12	0.34	434.19	41,624.68	2	45	12.19
Germany	143.46	0.25	0.26	1673.63	44,388.27	1	47	14.98
Hong Kong	60.14	0.46	0.54	1079.72	34,845.36	2	44	10.26
India	33.78	0.06	0.52	1022.54	1602.13	2	31	7.26
Ireland	255.8	0.47	0.36	1582.89	58,608.82	1	35	7.48
Italy	18.67	0	0	1562.21	35,085.34	2	40	14.07
Japan	268.05	0.42	0.26	1258.08	46,114.45	2	47	7.33
South Korea	37.42	0.31	0.25	1367.41	23,714.53	1	34	5.5
Liechtenstein	5.97	0.03	0	2545.08	124,345.02	1	31	6.55
Luxembourg	451.29	0.11	0.38	397.24	105,546.30	1	31	8.89
Malaysia	15.5	0.01	0.83	4197.49	10,132.25	2	39	9.02
Netherlands	40.64	0.12	0.35	2009.70	51,861.05	2	49	14.65
Norway	47.75	0.17	0.22	1983.37	89,549.03	1	50	13.56
Poland	6.86	0	2.19	1224.47	13,919.25	1	31	6.57
Portugal	1.65	0.05	2.26	2445.59	22,294.15	1	39	13.25
Singapore	11.09	0.11	0.72	1321.86	50,085.11	1	45	12.85
South Africa	5.4	0.16	0.3	1136.12	7440.74	1	32	10.37
Spain	19.86	0.13	1.17	1028.77	30,894.40	2	39	12.46
Sweden	113.49	0.1	1.15	1666.64	53,814.50	2	49	13.76
Switzerland	70.38	0.51	0.17	1632.16	75,934.33	1	50	10.65
Taiwan	20.56	0.2	0.68	912.05	20,604.56	1	40	10.37
Thailand	13.73	0.07	0.86	1260.18	5494.46	2	30	7.93
UK	444.19	0.17	0.51	454.04	40,753.81	1	47	15.05
USA	3602.84	0.36	0.24	638.26	50,688.54	2	48	14.17
Total	202.19	0.19	0.67	1446.39	42,538.04	1.47	41.34	10.48

Appendix C. Correlation matrix of fund-level variables by country of domicile

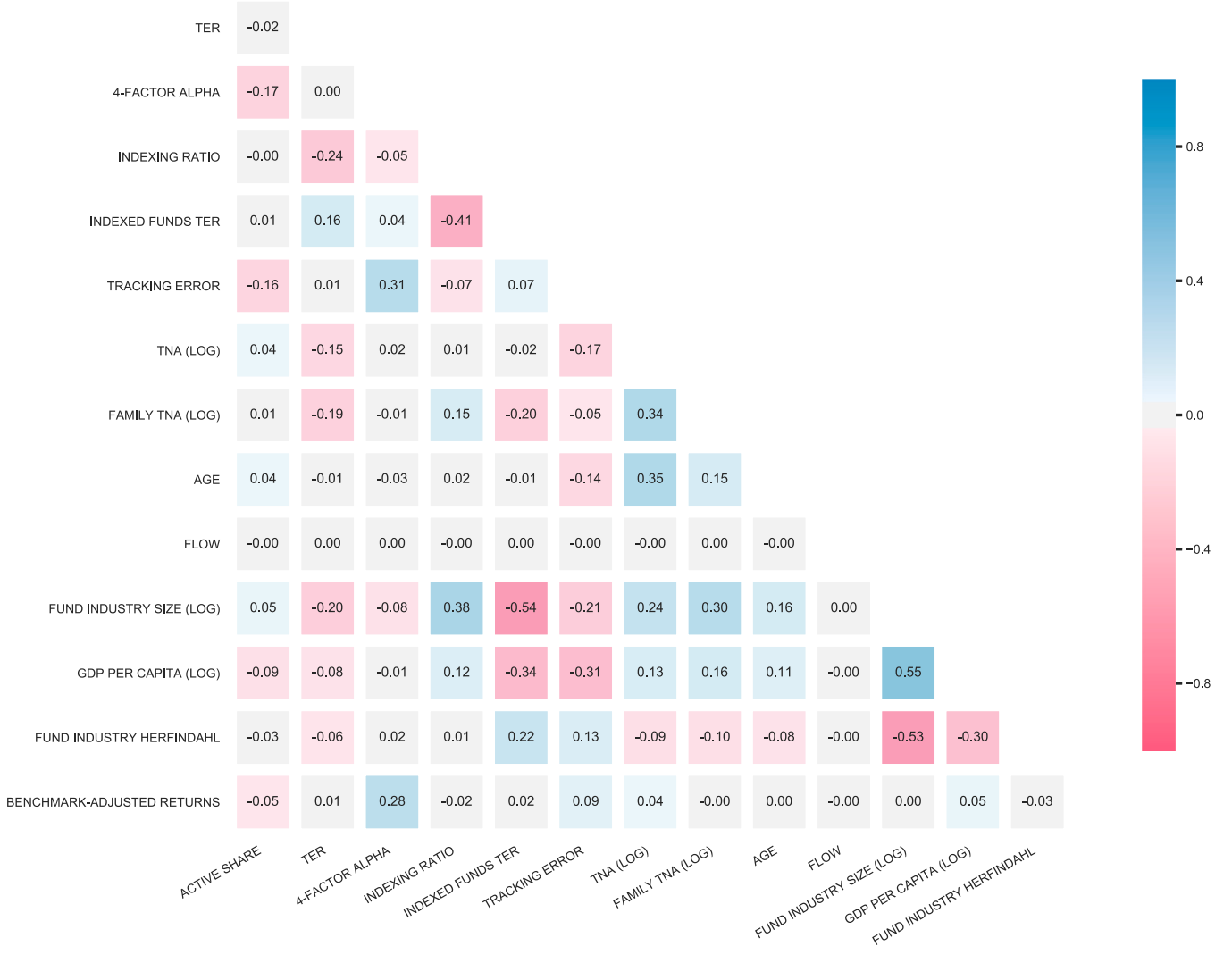

Fig. C.1. Correlation matrix of all key variables used in the fund-level tests by country of domicile. The sample includes open-end active mutual funds from 2008 to 2018.

Appendix D. Robustness: regressions using the sample between 2002 and 2007

Table D.1
Determinants of active share, 2002–2007.

	Dependent variable:			
	Active share	Active share	Active share	Active share
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0100		0.0640***	
	(0.0097)		(0.0180)	
Indexed funds TER		0.0048		0.0061
		(0.0040)		(0.0044)
Observations	50,324	50,225	16,959	16,711
R^2	0.2600	0.2600	0.3100	0.3200
Adjusted R^2	0.2600	0.2600	0.3100	0.3100

Notes: This table provides results of panel regressions in which the dependent variable across all models is the active share of a fund at the end of each year, calculated according to the model proposed by Amihud and Goyenko (2013). The sample includes actively managed equity mutual funds from 2002 to 2007. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 present the results of the tests exploring the association between active funds' activity and the market share of passive funds in each country; columns 2 and 4 display the results of the tests examining the relationship between such activity and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 4 (the coefficients are not shown), as well as benchmark and year dummies, as in Cremers et al. (2016). Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table D.2
Determinants of the TER of an active fund, 2002–2007.

	Dependent variable:			
	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.4300***		−1.0000***	
	(0.0310)		(0.0660)	
Indexed funds TER		−0.0110		0.1700***
		(0.0130)		(0.0170)
Observations	47,768	47,670	14,765	14,522
R^2	0.2300	0.2300	0.3800	0.3800
Adjusted R^2	0.2300	0.2300	0.3700	0.3700

Notes: This table provides results of panel regressions in which the dependent variable across all models is a three-year moving average of a fund's TER at the end of the year. The sample includes open-end active mutual funds from 2002 to 2007. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the results of the tests studying the association between active funds' fees and the market share of indexed funds in each country; columns 2 and 4 display the results of the tests analyzing the relationship between these fees and the TNA-weighted TERs of passive funds in each country. All of the regressions include the country and fund control variables used in Table 5 (the coefficients are not shown), as well as benchmark and year dummies, as in Cremers et al. (2016). Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table D.3
Determinants of the performance of active funds, 2002–2007.

	Dependent variable:			
	Four-factor alpha	Four-factor alpha	Four-factor alpha	Four-factor alpha
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0340***		−0.0058	
	(0.0085)		(0.0180)	
Indexed funds TER		0.0091***		0.0024
		(0.0026)		(0.0030)
Active share	0.0240***	0.0240***	0.0075	0.0079

(*continued on next page*)

Table D.3 (*continued*)

	Dependent variable:			
	Four-factor alpha	Four-factor alpha	Four-factor alpha	Four-factor alpha
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
	(0.0027)	(0.0027)	(0.0051)	(0.0053)
Tracking error	0.1400***	0.1400***	0.1700***	0.1700***
	(0.0350)	(0.0350)	(0.1800)	(0.1800)
Observations	37,995	37,896	12,730	12,538
R^2	0.3200	0.3200	0.4700	0.4700
Adjusted R^2	0.3200	0.3200	0.4700	0.4700

Notes: This table provides results of panel regressions in which the dependent variable across all models is the four-factor alpha of an active fund's benchmark-adjusted returns at the end of each year. The sample includes open-end active mutual funds from 2002 to 2007. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the outcomes of the tests examining the association between active funds' alpha and the market share of passive products in each country; columns 2 and 4 present the results of the tests investigating the relationship between these active funds' alpha and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 6 (the coefficients are not shown), as well as benchmark and year dummies, as in Cremers et al. (2016). Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix E. Robustness: regressions using a sample of non-US-domiciled funds

Table E.1
Determinants of active share for non-US-domiciled funds.

	Dependent variable:			
	Active share	Active share	Active share	Active share
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.0230***		−0.1200***	
	(0.0089)		(0.0099)	
Indexed funds TER		−0.0290***		0.0004
		(0.0046)		(0.0050)
Observations	302,517	302,517	94,278	93,488
R^2	0.3400	0.3400	0.3800	0.3800
Adjusted R^2	0.3400	0.3400	0.3800	0.3800

Notes: This table provides the results of panel regressions in which the dependent variable across all models is the active share of a fund at the end of each year, calculated according to the model proposed by Amihud and Goyenko (2013). The sample includes non-US-domiciled actively managed equity mutual funds from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 present the results of the tests exploring the association between active funds' activity and the market share of passive funds in each country; columns 2 and 4 display the results of the tests examining the relationship between such activity and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 4 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table E.2
Determinants of the TER of a non-US-domiciled active fund.

	Dependent variable:			
	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0570		0.4200***	
	(0.0390)		(0.0360)	
Indexed funds TER		0.0590***		0.0620***
		(0.0160)		(0.0220)
Observations	284,568	284,568	88,945	88,158
R^2	0.2000	0.2000	0.3500	0.3400
Adjusted R^2	0.2000	0.2000	0.3400	0.3400

Notes: This table provides results of panel regressions in which the dependent variable across all models is a three-year moving average of the TER of a fund at the end of the year. The sample includes non-US-domiciled open-end active mutual funds from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the results of the tests studying the association between active funds' fees and the market share of indexed funds in each country; columns 2 and 4 display the results of the tests analyzing the relationship between these fees and the TNA-weighted TERs of passive funds in each country. All of the regressions include the country and fund control variables used in Table 5 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table E.3
Determinants of the performance of non-US-domiciled active funds.

	Dependent variable:			
	Four-factor alpha	Four-factor alpha	Four-factor alpha	Four-factor alpha
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.1500***		0.1800***	
	(0.0060)		(0.0130)	
Indexed funds TER		0.0130***		0.0100***
		(0.0030)		(0.0039)
Active share	−0.0014	−0.0012	−0.0250***	−0.0280***
	(0.0014)	(0.0014)	(0.0036)	(0.0035)
Tracking error	0.7600***	0.7500***	0.2600	0.2500
	(0.0370)	(0.0370)	(0.1600)	(0.1600)
Observations	302,517	302,517	94,278	93,488
R^2	0.4600	0.4600	0.1900	0.1800
Adjusted R^2	0.4600	0.4600	0.1900	0.1800

Notes: This table provides results of panel regressions in which the dependent variable across all models is the four-factor alpha of an active fund's benchmark-adjusted returns at the end of each year. The sample includes non-US-domiciled open-end active mutual funds from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the outcomes of the tests examining the association between active funds' alpha and the market share of passive products in each country; columns 2 and 4 present the results of the tests investigating the relationship between these active funds' alpha and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 6 (the coefficients are not shown) as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix F. Robustness: regressions using a sample of funds domiciled and sold in the United States

Table F.1
Determinants of active share for US-domiciled funds.

	Dependent variable:			
	Active share	Active share	Active share	Active share
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0100		0.0380	
	(0.3000)		(0.3100)	
Indexed funds TER		0.0160		−0.0790
		(0.4700)		(0.6500)
Observations	17,591	17,591	16,015	16,015
R^2	0.1400	0.1400	0.1400	0.1400
Adjusted R^2	0.1400	0.1400	0.1400	0.1400

Notes: This table provides the results of panel regressions in which the dependent variable across all models is the active share of a fund at the end of each year, calculated according to the model proposed by Amihud and Goyenko (2013). The sample includes only actively managed equity mutual funds domiciled and sold in the United States from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* in year *y*. In columns 3 and 4, the observation unit is a fund *g* in year *y*. Columns 1 and 3 present the results of the tests exploring the association between active funds' activity and the market share of passive funds; columns 2 and 4 display the results of the tests examining the relationship between such activity and the TNA-weighted TERs of indexed funds. All of the regressions include the country and fund control variables used in Table 4 (the coefficients are not shown), as well as year and benchmark dummies. Robust standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table F.2
Determinants of the TER of a US-domiciled active fund.

	Dependent variable:			
	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.1900		−0.2200	
	(0.6500)		(0.6700)	
Indexed funds TER		0.2900		0.4600
		(1.0000)		(1.4000)
Observations	17,347	17,347	15,805	15,805
R^2	0.3600	0.3600	0.3700	0.3700
Adjusted R^2	0.3600	0.3600	0.3700	0.3700

Notes: This table provides results of panel regressions in which the dependent variable across all models is a three-year moving average of a fund's TER at the end of the year. The sample includes only actively managed equity mutual funds domiciled and sold in the United States from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* in year *y*. In columns 3 and 4, the observation unit is a fund *g* in year *y*. Columns 1 and 3 show the results of the tests studying the association between active funds' fees and the market share of indexed funds; columns 2 and 4 display the results of the tests analyzing the relationship between these fees and the TNA-weighted TERs of passive funds. All of the regressions include the country and fund control variables used in Table 5 (the coefficients are not shown), as well as year and benchmark dummies. Robust standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table F.3
Determinants of the performance of US-domiciled active funds.

	Dependent variable:			
	Four-factor alpha	Four-factor alpha	Four-factor alpha	Four-factor alpha
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.2100**		−0.2100*	
	(0.1000)		(0.1100)	
Indexed funds TER		0.3300**		0.4300*
		(0.1600)		(0.2300)
Active share	−0.0820***	−0.0820***	−0.0810***	−0.0810***
	(0.0026)	(0.0026)	(0.0027)	(0.0027)
Tracking error	−0.2900**	−0.2900**	−0.2800*	−0.2800*
	(0.1500)	(0.1500)	(0.1600)	(0.1600)
Observations	17,591	17,591	16,015	16,015
R^2	0.2400	0.2400	0.2400	0.2400
Adjusted R^2	0.2400	0.2400	0.2300	0.2300

Notes: This table provides results of panel regressions in which the dependent variable across all models is the four-factor alpha of an active fund's benchmark-adjusted returns at the end of each year. The sample includes only actively managed equity mutual funds domiciled and sold in the United States from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* in year *y*. In columns 3 and 4, the observation unit is a fund *g* in year *y*. Columns 1 and 3 show the outcomes of the tests examining the association between active funds' alpha and the market share of passive products; columns 2 and 4 present the results of the tests investigating the relationship between these active funds' alpha and the TNA-weighted TERs of indexed funds. All of the regressions include the country and fund control variables used in Table 6 (the coefficients are not shown), as well as year and benchmark dummies. Robust standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix G. Robustness: regressions using a sample of countries with more than 20 funds domiciled or for sale

Table G.1
Determinants of active share for countries with >20 funds domiciled or for sale.

	Dependent variable:			
	Active share	Active share	Active share	Active share
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0026		−0.1000***	
	(0.0091)		(0.0110)	
Indexed funds TER		0.0059		0.0120**
		(0.0046)		(0.0052)
Observations	315,207	315,207	100,764	100,764
R^2	0.3400	0.3400	0.3700	0.3700
Adjusted R^2	0.3300	0.3300	0.3600	0.3600

Notes: This table provides the results of panel regressions in which the dependent variable across all models is the active share of a fund at the end of each year, calculated according to the model proposed by Amihud and Goyenko (2013). The sample includes actively managed equity mutual funds of countries with more than 20 funds domiciled or for sale from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 present the results of the tests exploring the association between active funds' activity and the market share of passive funds in each country; columns 2 and 4 display the results of the tests examining the relationship between such activity and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 4 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels respectively.

Table G.2
Determinants of the TER of an active fund for countries with >20 funds domiciled or for sale.

	Dependent variable:			
	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0630		0.7500***	
	(0.0400)		(0.0450)	
Indexed funds TER		0.0370**		0.0360
		(0.0160)		(0.0230)
Observations	297,246	297,246	95,640	95,640
R^2	0.2500	0.2500	0.4000	0.4000
Adjusted R^2	0.2500	0.2500	0.4000	0.4000

Notes: This table provides results of panel regressions in which the dependent variable across all models is a three-year moving average of a fund's TER at the end of the year. The sample includes actively managed equity mutual funds of countries with more than 20 funds domiciled or for sale from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the results of the tests studying the association between active funds' fees and the market share of indexed funds in each country; columns 2 and 4 display the results of the tests analyzing the relationship between these fees and the TNA-weighted TERs of passive funds in each country. All of the regressions include the country and fund control variables used in Table 5 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table G.3
Determinants of the performance of active funds for countries with >20 funds domiciled or for sale.

	Dependent variable:			
	Four-factor alpha	Four-factor alpha	Four-factor alpha	Four-factor alpha
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.1500***		0.2700***	
	(0.0062)		(0.0170)	
Indexed funds TER		0.0081***		0.0066*
		(0.0030)		(0.0038)
Active share	−0.0077***	−0.0078***	−0.0370***	−0.0390***
	(0.0014)	(0.0014)	(0.0026)	(0.0026)
Tracking error	0.7400***	0.7400***	0.2400	0.2300
	(0.0380)	(0.0380)	(0.1600)	(0.1600)
Observations	315,207	315,207	100,764	100,764
R^2	0.4500	0.4500	0.2000	0.1900
Adjusted R^2	0.4500	0.4500	0.2000	0.1900

Notes: This table provides results of panel regressions in which the dependent variable across all models is the four-factor alpha of an active fund's benchmark-adjusted returns at the end of each year. The sample includes actively managed equity mutual funds of countries with more than 20 funds domiciled or for sale from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the outcomes of the tests examining the association between active funds' alpha and the market share of passive products in each country; columns 2 and 4 present the results of the tests investigating the relationship between these active funds' alpha and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 6 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix H. Robustness: regressions using a sample of countries of domicile with greater than 0.75% market share of equity funds

Table H.1
Determinants of active share for funds in countries with market share >0.75%.

	Dependent variable:			
	Active share	Active share	Active share	Active share
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0210**		−0.0780***	
	(0.0098)		(0.0190)	
Indexed funds TER		−0.0450***		−0.0190***
		(0.0053)		(0.0071)
Observations	266,986	266,986	68,641	68,641
R^2	0.3500	0.3500	0.4200	0.4200
Adjusted R^2	0.3500	0.3500	0.4200	0.4200

Notes: This table provides the results of panel regressions in which the dependent variable across all models is the active share of a fund at the end of each year, calculated according to the model proposed by Amihud and Goyenko (2013). The sample includes actively managed equity funds domiciled in countries with greater than 0.75% market share of the entire equity fund industry between 2008 and 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 present the results of the tests exploring the association between active funds' activity and the market share of passive funds in each country; columns 2 and 4 display the results of the tests examining the relationship between such activity and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 4 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table H.2
Determinants of the TER of an active fund in countries with market share >0.75%.

	Dependent variable:			
	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.0550		0.3100***	
	(0.0430)		(0.0990)	
Indexed funds TER		0.0130		0.1400***
		(0.0180)		(0.0360)
Observations	250,326	250,326	64,025	64,025
R^2	0.1900	0.1900	0.3000	0.3000
Adjusted R^2	0.1900	0.1900	0.3000	0.3000

Notes: This table provides results of panel regressions in which the dependent variable across all models is a three-year moving average of a fund's TER at the end of the year. The sample includes actively managed equity funds domiciled in countries with greater than 0.75% market share of the entire equity fund industry between 2008 and 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the results of the tests studying the association between active funds' fees and the market share of indexed funds in each country; columns 2 and 4 display the results of the tests analyzing the relationship between these fees and the TNA-weighted TERs of passive funds in each country. All of the regressions include the country and fund control variables used in Table 5 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table H.3
Determinants of the performance of active funds in countries with market share >0.75%.

	Dependent variable:			
	Four-factor alpha	Four-factor alpha	Four-factor alpha	Four-factor alpha
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.1600***		0.2100***	
	(0.0068)		(0.0190)	
Indexed funds TER		0.0240***		0.0610***
		(0.0035)		(0.0063)
Active share	0.0022	0.0022	−0.0250***	−0.0260***
	(0.0015)	(0.0015)	(0.0030)	(0.0030)
Tracking error	0.7900***	0.7900***	0.3800**	0.3800**
	(0.0340)	(0.0340)	(0.1600)	(0.1600)
Observations	266,986	266,986	68,641	68,641
R^2	0.5100	0.5100	0.2300	0.2300
Adjusted R^2	0.5100	0.5100	0.2300	0.2300

Notes: This table provides results of panel regressions in which the dependent variable across all models is the four-factor alpha of an active fund's benchmark-adjusted returns at the end of each year. The sample includes actively managed equity funds domiciled in countries with greater than 0.75% market share of the entire equity fund industry between 2008 and 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the outcomes of the tests examining the association between active funds' alpha and the market share of passive products in each country; columns 2 and 4 present the results of the tests investigating the relationship between these active funds' alpha and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 6 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix I. Robustness: regressions using the capital asset pricing model (CAPM)

Table I.1
Determinants of active share.

	Dependent variable:			
	Active share	Active share	Active share	Active share
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.1400***		−0.0740***	
	(0.0080)		(0.0099)	
Indexed funds TER		0.0360***		0.0650***
		(0.0041)		(0.0046)
Observations	320,249	320,249	110,293	109,503
R^2	0.4400	0.4400	0.4300	0.4300
Adjusted R^2	0.4400	0.4400	0.4300	0.4300

Notes: This table provides results of panel regressions in which the dependent variable across all models is the active share of a fund at the end of each year, calculated according to the model proposed by Amihud and Goyenko (2013) and the CAPM. The sample includes actively managed equity mutual funds from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 present the results of the tests exploring the association between active funds' activity and the market share of passive funds in each country; columns 2 and 4 display the results of the tests examining the relationship between such activity and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 4 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table I.2
Determinants of the TER of an active fund.

	Dependent variable:			
	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)	Total expense ratio (TER)
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	−0.0730*		0.3300***	
	(0.0400)		(0.0370)	
Indexed funds TER		0.0032		−0.0240
		(0.0160)		(0.0230)
Observations	336,031	336,031	115,259	114,392
R^2	0.2200	0.2200	0.3600	0.3600
Adjusted R^2	0.2200	0.2200	0.3600	0.3600

Notes: This table provides results of panel regressions in which the dependent variable across all models is a three-year moving average of a fund's TER at the end of the year. The active share and alphas are calculated according to the CAPM. The sample includes open-end active mutual funds from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the results of the tests studying the association between active funds' fees and the market share of indexed funds in each country; columns 2 and 4 display the results of the tests analyzing the relationship between these fees and the TNA-weighted TERs of passive funds in each country. All of the regressions include the country and fund control variables used in Table 5 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Table I.3
Determinants of the performance of active funds.

	Dependent variable:			
	Four-factor alpha	Four-factor alpha	Four-factor alpha	Four-factor alpha
	By country of sale		By country of domicile	
	(1)	(2)	(3)	(4)
Indexing ratio	0.1100***		0.1600***	
	(0.0054)		(0.0090)	
Indexed funds TER		−0.0005		−0.0059
		(0.0027)		(0.0037)
Active share	−0.0140***	−0.0140***	−0.0350***	−0.0370***
	(0.0012)	(0.0012)	(0.0025)	(0.0025)
Tracking error	0.5000***	0.5000***	0.0790	0.0740
	(0.0240)	(0.0240)	(0.1200)	(0.1200)
Observations	260,806	260,806	89,556	88,793
R^2	0.2700	0.2700	0.4300	0.4200
Adjusted R^2	0.2600	0.2600	0.4200	0.4200

Notes: This table provides results of panel regressions in which the dependent variable across all models is the CAPM alpha of an active fund's benchmark-adjusted returns at the end of each year. The active share is also calculated according to the CAPM. The sample includes open-end active mutual funds from 2008 to 2018. In columns 1 and 2, the observation unit is a fund *f* sold in country *c* in year *y*. In columns 3 and 4, the observation unit is a fund *g* domiciled in country *d* in year *y*. Columns 1 and 3 show the outcomes of the tests examining the association between active funds' alpha and the market share of passive products in each country; columns 2 and 4 present the results of the tests investigating the relationship between these active funds' alpha and the TNA-weighted TERs of indexed funds in each country. All of the regressions include the country and fund control variables used in Table 6 (the coefficients are not shown), as well as year, benchmark, and country dummies. Country-level clustered robust standard errors are reported in parentheses by the fund's country of sale (columns 1 and 2) or domicile (columns 3 and 4). *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

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