J. Finan. Intermediation 50 (2022) 100959

Contents lists available at ScienceDirect

Journal of Financial Intermediation

journal homepage: www.elsevier.com/locate/jfi

The Costs and Benefits of Performance Fees in Mutual Funds

Henri Servaes [a,*], Kari Sigurdsson [b]

[a] London Business School, CEPR and ECGI, UK
[b] Schroders, UK

ARTICLE INFO

Keywords:
Performance fees in mutual funds
Fund returns
Fund expenses
Risk-taking incentives
Fund flows

ABSTRACT

Funds with performance fees have annual net risk-adjusted returns of 0.50% below other funds, a result mostly due to funds without a stochastic benchmark against which performance is measured and funds with a benchmark that is easy to beat. For other funds, there is no evidence of underperformance. Performance fee funds charge total expenses, including the performance fee, that are substantially higher than those of other funds. Investors are more likely to punish poor performance in funds with performance fees than in other funds. Our results indicate that even when fees are less regulated, investors can generally be relied upon to make the right choices, but that there are a subset of funds where performance fees are employed to extract additional fees from investors.

1. Introduction

Mutual funds charge different types of fees for their asset management services. The most common fee structure is a fixed percentage of assets under management.[1] In addition, a substantial and growing fraction of mutual funds earn performance/incentive fees that are based on their returns relative to a benchmark. Asymmetric performance fees (APFs) reward the fund manager for outperformance relative to such a benchmark over a predefined assessment period, but do not penalize poor performance. Symmetric performance fees impose a penalty for underperformance equal to the gain for outperformance.

Performance fee (PF) funds are controversial. On the one hand, they are aimed at improving performance by aligning the incentives of the portfolio manager with those of the investor, much like stock options or share ownership do for company executives. Both the investor and the fund manager do better when the fund performs well and, consequently, management effort should be higher for funds with incentive fees. On the other hand, it has been argued that performance fees can lead to excessive risk taking, especially when the fees are asymmetric, due to their option-like nature. This concern prompted the US Congress in 1971, on the recommendation of the Securities and Exchange Commission (SEC), to prohibit the use of asymmetric performance fees in US mutual funds. Only funds with symmetric fees, also called fulcrum fees, are allowed. In addition, performance fees are less transparent than other fees, which may make it difficult for retail investors in particular to understand the details of the performance fee contract, and may allow some fund companies to structure the PF contract to earn excess fee under the guise of performance alignment.

In Europe, both symmetric and asymmetric performance fees are allowed under the UCITS (Undertakings for Collective Investment in Transferable Securities) directive, which allows collective investment schemes to operate freely throughout the European Union (EU) on the basis of a single authorization from one member state. However, national regulators have put in place additional restrictions on the ability of funds domiciled in their countries to charge such fees. In the UK, for example, the Financial Services Authority (FSA) (now called Financial Conduct Authority) decided in April 2004 to allow performance fees after an extensive review of regulations of collective investment schemes. In addition, funds can also be established pursuant to domestic law only, in which case the specific regulations of the authorising country apply. Such funds cannot be sold in other countries. These funds are often more speculative and invest in alternative assets such as real estate and private equity, and often also charge asymmetric performance fees.

Thus, fee structures are a lot less regulated in European markets than in the US market. One of the goals of this paper is to investigate whether investors have sufficient understanding of these fee structures and their effect on performance when allocating capital. In addition, studying risk

* Corresponding author:
E-mail address: hservaes@london.edu (H. Servaes).

[1] This includes the management fee and additional fees paid by fund investors such as custodian and administration fees. Khorana et al. (2009) estimate the worldwide average management fees for equity funds to be 1.24% and total fees to be 1.87% of assets.

https://doi.org/10.1016/j.jfi.2022.100959
Received 1 December 2020; Received in revised form 19 January 2022; Accepted 20 January 2022
Available online 26 January 2022

and return in PF funds is also important because these funds continue to be on the agenda of regulators and because a number of fund management companies have recently introduced such funds.

In terms of regulation, both the Financial Conduct Authority (FCA) in the UK and the European Securities and Markets Authority (ESMA) are investigating whether to continue allowing performance fees in funds domiciled in the UK and the EU. One argument being made in the FCA's Asset Management Market Study Report that was published in June of 2017 (Financial Conduct Authority (2017)) is that performance fee funds use benchmarks that are easy to beat and not consistent with their underlying investment objectives. The ESMA, on the other hand, wants to make sure that enough information is available to determine what a fund's net returns are after the inclusion of all fees. In fact, in July of 2019, it launched a consultation paper with proposed guidelines on the application of performance fees for UCITS. Regulators are also concerned about the effect of performance fees on risk taking, although they are not clear on the direction of the effect. For example, when the FSA allowed performance fees funds in the UK for the first time in 2004, they commented that PF funds "…may also affect the degree of investment risk that AFMs [authorized fund managers] adopt on behalf of the fund. At times an AFM may adopt a more risky investment strategy to try to achieve better performance and at other times a less risky strategy in order to protect previous performance that has attracted or secured a performance fee." (FSA 2003, p.9)

The investor community and fund managers in Europe have also become keenly interested in the merits of PF funds since October 2017 when Fidelity International, which manages more than $250 billion in assets, announced the introduction of (symmetric) performance fees for all its actively managed mutual funds, coupled with a reduction in their regular management fee. In the US, where few complexes offer PF funds, Alliance Bernstein introduced a series of FlexFee Funds in 2017, which also charge (symmetric) performance fees. In an article commenting on this development, Morningstar wrote that "Performance-based fees, while not a panacea, represent a potentially useful innovation that more funds ought to consider to better align with investors" (Ptak (2017)). This assessment is testament to the increasing prominence of performance fees in the fund industry.

Discussions about the merits of PF funds have been hampered by the lack of quantifiable evidence of the impact of charging performance fees. This is partly because asymmetric performance fees are banned in the US mutual fund industry, thus preventing empirical research on the topic using recent US data. Golec and Starks (2004) show that 35 US growth funds with asymmetric performance fees that were forced to change their compensation scheme as a result of the US regulatory changes in 1971 decreased their risk exposure, but also lost assets and shareholders. Elton et al. (2003) analyse 108 US mutual funds with symmetric performance fees (which are allowed in the US). They find that such funds exhibit better stock picking ability and lower expenses; these funds also increase risk after a period of poor performance and decrease it after a period of good performance. However, given their symmetric nature, it is not clear that these findings would also apply to APF funds. Moreover, the sample being studied is relatively small.

Work on PF funds in Europe and elsewhere has been limited to country-specific studies. Drago et al. (2010) study performance fees for Italian funds in 2006. They find no evidence that such fees are associated with increased risk taking or that they impact performance. Instead, they argue that performance fees are employed by fund managers to weaken price competition among managers through a less transparent and harder to compare pricing policy. (Díaz-Mendoza, López-Espinosa and Martinez, 2014) study Spanish funds and find that PF funds outperform other funds on a risk-adjusted basis. Moreover, they find that performance is positively related to the magnitude of the performance fees. Finally Hamdani et al. (2017) find that the introduction of performance fees in the Israeli pension fund sector improved the risk-adjusted performance of PF funds.

There is also some related work on performance fees in hedge funds. Agarwal et al. (2009) study the combined incentive effect of performance fees and managerial co-investment and find that these incentives are associated with improved performance, but performance fees alone are not. It is not clear, however, that these results would generalize to the mutual fund industry. Hedge funds operate in a regulatory environment that is substantially different from that of mutual funds. They are generally domiciled offshore and are therefore free to pursue whatever strategy they like while mutual funds are typically domiciled in home countries and tightly regulated by authorities. Hedge funds also cater to sophisticated investors who are likely to have a much better understanding of the fee structure and the associated incentives than the typical mutual fund investor. Moreover, as we will document later, the exact nature of the performance fee contract differs substantially between mutual funds and hedge funds. Finally, since virtually all hedge funds charge performance fees, it is not possible to compare PF and non-PF funds.

In this paper, we study all equity mutual funds offered for sale in the EU (including the UK which exited the EU in 2020), Norway, and Switzerland over the period 2001-2011 and compare PF funds to other funds across several dimensions, including returns, fees, and risk-taking to shed light on various arguments made by regulators, investors, and fund management companies. Our sample consists of over 100,000 fund-year observations, comprising over 200,000 different fund-class-years.[2] Over seven percent of these funds charge some kind of performance fee.

Our first contribution is to provide detailed descriptive statistics on the various components of PF contracts. The median performance fee in our sample is 20% of excess performance, which is very similar to what is being charged in the hedge fund industry. Only one in eight funds puts a cap on performance fees. Seventy percent of the funds have a stochastic benchmark against which performance is measured, generally a stock index, while 15% of funds measure performance relative to a fixed hurdle. Forty-four percent of funds have high water marks (HWM), so that performance fees are not earned until the HWM–the best prior performance over a given period–has been reached. These numbers indicate that there is a large diversity in the exact way in which performance fee contracts are being implemented.

Second, we provide a detailed analysis of the excess returns earned by PF funds. We find that PF funds perform worse than other funds by between 50 and 70 basis points per year, with much of the poor performance concentrated in two subcategories: funds that do not set a stochastic benchmark against which performance is measured and funds that set a benchmark that is easy to beat. Funds without a stochastic benchmark earn performance fees for beating either a low fixed hurdle or for earning returns above zero. Similarly, funds that employ a benchmark that does not reflect the expected performance of the assets in the fund can earn performance fees even when returns are low. Such structures do not appear to be in the best interest of fund investors. To address the concern that differences in performance are due to differences in managerial skill, we also confirm that the evidence of underperformance persists when including manager fixed effects, so that we compare returns earned by the same manager responsible for both a PF and a non-PF fund. Further analysis reveals that only 20% of PF funds fall into these underperforming categories. For other PF funds, the level of underperformance is smaller and generally insignificant. Thus, most investors are not losing out from investing in PF funds, but we find no evidence to support the view that PF funds outperform because the interests of investors and fund management companies are more aligned in these structures.

[2] A given fund may have different fund classes. The classes can differ in terms of expenses, minimum investment, and loads. However, the underlying assets are the same for all classes of a fund. Because of potential differences in expenses, the net (after expenses) returns can differ across classes of the same fund.

Third, we study whether PF funds' expenses differ from those of regular funds. The overall expense ratio of funds that charge performance fees, which is inclusive of the performance fee itself, is approximately 30 to 35 basis points higher than that of other funds. Thus, PF funds charge more for their services than other funds, even though a subset of these funds underperform. In fact, over half of the underperformance of PF funds is due to higher expenses. Funds without a stochastic benchmark stand out in particular in terms of the magnitude of their fees. When we compute gross returns by adding expenses back to net returns, the poor performance of PF funds is significantly attenuated, suggesting that the PF structure serves in a number of cases as a mechanism to extract excess(ive) fees from investors.

Fourth, there is no evidence that PF funds take more risk overall relative to other funds or that PF funds whose PF contract is out of the money in the middle of the year due to poor performance increase risk in the second half of the year. We do find that PF funds have higher objective-adjusted return volatility, which indicates that they are less likely to hug their benchmarks than other funds. There is also some evidence that they increase risk in the second half of the year when the sensitivity of changes in the PF contract payoffs to changes in risk is highest.

Fifth, there is no evidence that PF funds attract more inflows conditional on performance. In fact, there is some indication that the worst quintile of PF funds attract less money than the worst non-PF funds. In addition, holding performance constant, the inflows into funds without stochastic benchmarks are significantly lower than those in other funds, suggesting that investor realize that the interests of investors and funds are not aligned when benchmarks are absent.

Sixth, we find that a subset of PF funds change the terms of the PF contract after poor performance by dropping the use of a stochastic benchmark or lowering the hurdle rate, such that it becomes easier to earn performance fees in subsequent years. Such changes do not appear to be in the best interest of fund investors. The subsequent performance of these funds is particularly poor, ranging from -0.75% to -2% per year relative to other PF funds.

From a regulatory perspective, our evidence does not support banning PF fund structures. In fact, a large fraction of the funds have set up a structure that does not appear to take advantage of investors. What is clear, however, is that a substantial minority of funds are able to game their fees by not setting a stochastic performance benchmark at all or by setting one that is easy to beat. In that regard, in the UK, the FCA has set up a working group that is considering ways of providing greater clarity of fund objectives for all funds, not just PF funds.

In addition to our contribution to the regulatory debate regarding the merits of PF funds, our work also contributes to the literature on incentive mechanisms in the fund industry more broadly. Performance fees are but one type of incentive mechanisms that are found in mutual funds. Other incentives that have been studied in the literature include managerial ownership in the fund (Khorana et al. (2007)), threat of dismissal if the portfolio manager performs poorly (Khorana (1996), Chevalier and Ellison (1999) and Ding and Wermers (2012)), the relationship between flows and performance (Ippolito (1992), Chevalier and Ellison (1997), Sirri and Tufano (1998), and Berk and Green (2004)), and the shape of the relation between funds under management and the management fee (Massa and Pattgiri (2009)). Two recent articles study the compensation contract between the fund management company and the fund manager. Ibert et al. (2018) analyze fund manager compensation in the Swedish fund industry and report a concave relation between pay and revenue and weak sensitivity of pay to performance. Ma et al. (2019) analyze compensation contracts of US mutual fund managers and they find a strong prevalence of performance-based pay. This evidence indicates that fund management companies can employ performance-based pay for their managers, even if they do not charge performance-based fees to their investors. With PF contracts in place, however, the opportunity to share rents with fund managers is clearly enhanced. Moreover, independent of whether rents are shared between the fund and the fund manager, our findings suggest that the (poor) implementation of the performance fee contract between the investor and the fund management company is related to low investor returns. For the majority of PF funds, however, there is no evidence of underperformance, consistent with the findings of Ma et al. (2019).

The remainder of this paper is organized as follows. In the next section, we discuss the data and provide some descriptive statistics on contractual features of PF funds. Section 3 contains analyses of performance, expenses, risk taking, inflows, and managerial skill. Section 4 concludes. In the Appendix, we study the relation between various fund, fund family, and managerial characteristics and the likelihood of adopting a PF structure.

2.Data

The data on European equity mutual funds and performance fees come from two sources. From Morningstar Direct, we gather data on all equity mutual funds offered for sale in the EU, Norway, and Switzerland over the period 2001-2011. This database, which is survivorship free, contains historical data on returns, expense ratios, and fund assets for virtually all mutual funds offered for sale throughout the world, albeit that the coverage on fund size and expenses is more sparse during the initial years of our sample. We gather both daily and monthly return data and annual data on fund size and expenses.[3] To make sure that the funds being studied are targeted to retail investors, we remove any fund if all of its classes have a minimum investment level in excess of €50,000.[4] This procedure eliminates less than 2.5% of all funds. We combine this database with detailed information on PF funds from Fitzrovia (now Fitz Partners).[5] Fitzrovia follows a two-step data collection process. First, it studies annual reports of funds to find any mention of a performance fee being charged. If a report contains information on performance fees, then Fitzrovia contacts the fund management complex to ask if there are any other PF funds within the complex. It also gathers from the fund complex all the details on the PF contracts for all of its PF funds. Once a fund complex has been contacted, it remains in the database in subsequent years and all its funds are automatically covered if they have PF structures. While full details on all the features of the PF contract are not available for every PF fund, less than 3% of the PF observations have some missing data items. Detailed data on performance fee contracts have not been collected for the post-2011 period.

Panel A of Table 1 provides an overview of the number of funds and number of fund classes by year for both PF and non-PF funds. We also include the number of non-PF funds in fund complexes that offer PF funds, as in some of our analyses we will restrict ourselves to complexes that offer both types of products. By 2010, our sample covers over 10,000 funds in total, comprising more than 24,000 fund classes, and PF funds make up over 8% of all funds. Note that there is a substantial decline in the number of PF funds in 2011, because the dataset was not fully completed by the data vendor. As such, for 2011 only, we are likely to classify some PF funds as non-PF funds. We have verified that all our findings remain unchanged if we exclude 2011 from our sample altogether.

[3] For the time period we study, size data are available at the fund level, but not at the fund class level.

[4] We also apply some filters to the fund size numbers to remove fund observations on size that appear to be erroneous. In particular, for funds larger than €100 million, we remove all the size data of a particular fund if the size of the fund more than triples or if it loses two thirds of its assets in any given month. Applying this filter affects less than one percent of all observations and does not affect our inferences. We do not apply this filter to smaller funds because they can grow very quickly after they have just been established.

[5] Fitzrovia International plc was a UK-based research company specializing in total expense ratio analysis for funds outside the US. It was acquired by Lipper Ltd in October 2004, and several years later spun out as Fitz Partners.

Table 1
Sample overview. The sample includes all equity funds that are distributed in the European Union, Norway, or Switzerland according to the Morningstar Direct database. Performance fee (PF) information is obtained from Fitzrovia.

Panel A: Number of funds per year

	Non-PF funds		Non-PF funds in complexes with PF funds		PF funds		
	Funds	Classes	Funds	Classes	Funds	%	Classes
2001	6,362	9,900	1,630	2,554	305	4.6	371
2002	6,758	11,083	1,909	3,177	521	7.2	633
2003	7,259	12,254	2,256	3,799	553	7.1	692
2004	7,644	13,136	2,503	4,347	641	7.7	1,112
2005	8,266	14,930	2,781	5,140	656	7.4	1,169
2006	9,123	17,617	3,539	6,935	732	7.4	1,429
2007	9,726	19,994	4,282	8,787	855	8.1	1,765
2008	10,085	21,784	5,000	11,442	829	7.6	2,086
2009	9,775	21,955	5,017	11,828	871	8.2	2,173
2010	9,321	21,875	4,915	12,200	830	8.2	2,180
2011	9,493	23,775	5,114	13,667	528	5.3	1,486

Panel B: Fund size (in € millions)

	Non-PF funds		PF funds	
	Mean	Median	Mean	Median
2001	210	57	64	35
2002	138	39	182	49
2003	145	39	181	84
2004	159	44	193	76
2005	217	66	234	83
2006	249	69	293	98
2007	220	57	244	68
2008	102	25	120	30
2009	146	35	158	37
2010	185	44	185	48
2011	157	37	171	44

Panel C: Fund domicile – each fund/year is one observation

	Non-PF Funds	PF Funds	% PF Funds
Austria	3,391	6	0.2
Belgium	2,862	35	1.2
Czech Republic	16	0	0
Denmark	3,002	0	0
Estonia	134	0	0
Finland	2,208	0	0
France	13,238	340	2.5
Germany	4,818	383	7.4
Greece	144	0	0
Hungary	24	0	0
Ireland	5,263	594	10.1
Italy	1,463	2,013	57.9
Latvia	13	0	0
Lithuania	57	0	0
Luxembourg	26,476	3,344	11.2
Malta	19	0	0
Netherlands	1,705	2	0.1
Norway	1,753	0	0
Poland	233	0	0
Portugal	709	0	0
Slovenia	438	0	0
Spain	5,273	356	6.3
Sweden	3,506	13	0.4
Switzerland	3,222	96	2.9
United Kingdom	11,958	102	0.8
Off shore	1,869	37	1.9
Total	93,812	7,321	7.2

Table 2

Fee structure for performance fee equity mutual funds. The sample consists of all equity mutual funds registered for sale in the European Union, Norway, or Switzerland according to the Morningstar Direct database. This table covers those funds that charge performance fees. Performance fee is the percentage fee charged on return performance above a pre-specified benchmark or zero if no benchmark is specified. Stochastic benchmark is equal to one if the fund specifies an index as its benchmark. Performance fee cap is equal to one if performance fees are capped at a given percentage of assets under management. Accrual frequency is the frequency in days with which performance fees are moved to a separate account. Crystallization frequency is the frequency in days with which performance fees are paid to the fund management company. High-water mark (HWM) is equal to one if the fund does not earn performance fees unless it has reached its previous high over a given period. Permanent HWM is equal to one if the HWM is permanent implying that the fund does not earn performance fees unless it has reached its all-time high. HWM duration is the length of the period in months over which the high water mark is assessed for funds for which the HWM is not permanent. Hurdle is equal to one if the fund has to meet a certain performance hurdle, usually a fixed percentage or a money market rate, before performance fees are paid. The total expense ratio includes the management fee, all other expenses, and performance fees, if paid.

	Mean	Median	N
Performance fee (% of outperformance)	16.48%	20.00%	7,105
Based on stochastic benchmark (% of total funds)	71.24%		7,308
Performance fee cap (% of total funds)	12.24%		7,321
Accrual frequency (days)	2.53	1	7,307
Crystallization frequency (days)	262	365	7,307
High-water mark (HWM) (% of total funds)	44.20%		7,321
Permanent HWM (% of HWM funds)	64.55%		2,908
HWM duration if not permanent (months)	11.87	12	794
Hurdle (% of total funds)	14.86%		7,308
Total expense ratio (% of total net assets)	2.34%	2.07%	3,273

In Panel B of Table 1, we display mean and median fund sizes for PF and non-PF funds. The assets of both sets of funds follow the general pattern of stock returns, peaking in 2007 before the large drop-off in 2008 when the financial crisis started. By the end of 2011, the fund sizes had not yet returned to their pre-crisis magnitudes. Except for 2001, PF and non-PF funds are roughly of equal size.[6] Multiplying average fund size with the number of funds listed in Panel A, indicates that by 2010 $154 billion of equities were managed in a PF structure in Europe.

In Panel C we list the funds by country of domicile. This evidence seems to suggest that PF funds are mainly an Italian phenomenon, where they make up 58% of all funds, and that they are not very relevant in the remainder of the Europe. However, this is not correct. PF funds also comprise more than 10% of the funds domiciled in Ireland and Luxembourg, and as pointed out by Khorana et al. (2005), these countries serve as hubs for the distribution of funds across Europe. This also explains why there are more funds domiciled in Luxembourg than in any other country in our sample. Many of the Luxembourg-domiciled funds will be offered for sale in a large fraction of countries in the European Union and beyond, which implies that PF fund structures are relevant throughout the continent. Germany is the fourth most popular country in terms of relative importance of PF funds domiciled there at 7.4%.[7]

Table 2 provides summary statistics on the contractual features of the PF funds in our sample. Each fund/year is counted as one observation. We start by documenting the performance fee percentage, which is 16.48% on average, with a median of 20%. These numbers are very similar to fees in the hedge fund industry. Agarwal et al. (2009) report a mean of 16.3% and a median of 20%. What is different is that for 71.2% of the funds in our sample, the performance fee is only paid when the returns exceed a specific stochastic benchmark, which is generally a stock market index, or a combination of indices. For example, *Dexia Equities L–World* uses the MSCI World index as a benchmark and *Euromobiliare Growth Equity Fund* uses a weighted average of the MSCI World index (90%) and the Italian money market index MTS BOT (10%). Because hedge funds often pursue market neutral strategies, stochastic benchmarks are generally non-existent in the hedge fund industry.

The performance fees are capped for a little over 12% of the funds. Uncapped fees cannot be symmetric as fund management companies would have to pay investors for poor performance in these cases.

We also report on the accrual and crystallization frequencies. The accrual frequency is the frequency with which the fees are put aside into a separate account. This is important because when investors buy into a fund that has performed well, they do not want to pay a NAV that includes a forthcoming payment to the fund management company for excellent past performance. The crystallization frequency is the frequency with which the fees are actually paid. The accrual frequency is about 2.5 days, on average, but more than 90% of funds have an accrual frequency of one day. The crystallization frequency averages 262 days, but is typically one year.

Forty four percent of all PF funds in our sample have a HWM, compared to 80% of hedge funds in Agarwal et al. (2009). A HWM ensures that performance fees are not accrued and paid until the fund reaches the previous high over a given period. The high water mark can be defined on a rolling basis, for example, the manager might be required to reach the previous three-year high before earning performance fees; alternatively, it can be permanent and go back until the PF contract was first implemented. In our sample, 64.5% of funds with HWMs have a permanent HWM. For the funds with a rolling HWM window, the window is close to one year.

Some funds impose a hurdle rate, which is either a fixed performance benchmark or a money market rate that needs to be exceeded before performance fees can be earned. This is the case for close to 15% of the funds in our sample, compared to 60% in the hedge fund sample of Agarwal et al. (2009). Imposing a hurdle ensures that funds do not pay performance fees if they exceed their benchmark but earn negative returns. Some funds do not have a stochastic benchmark at all, and they just have a hurdle. Other funds have no benchmark nor a hurdle and essentially earn a performance fee as soon as their performance exceeds zero.

Finally, we report that the average expense ratio of the PF funds in our sample is 2.34%. The expense ratio, as reported in the Morningstar Direct database, includes management fees, other expenses, and also performance fees, if paid.

[6] We have also checked for other differences between PF and non-PF funds. PF funds belong to smaller fund complexes and they are younger. Team managed funds, funds with a smaller initial investment, and funds managed by more experienced managers are more likely to have a PF structure, suggesting that agency problems and the presence of alternative monitoring mechanisms matter in the adoption of performance fees. In addition, funds managed by banks, insurance companies and brokerage houses are less likely to have a PF structure. The Appendix contains a detailed analysis of the factors affecting the adoption of performance fees. We control for complex size in many of our regression specifications; controlling for the other factors associated with the adoption of performance fees does not affect our inferences.

[7] Our findings persist if we remove any one of the four countries where PF funds are most prominent, and if we remove countries in which there are no PF funds domiciled.

3. Results

In this section, we discuss the returns, expenses, risk, and flows of PF funds and compare them to non-PF funds.

3.1. Fund returns

Here we investigate whether PF funds earn excess returns compared to their investment objective and compared to non-PF funds. The main argument as to why PF funds may earn excess returns is because the incentives for the fund management company are steeper in such funds. The positive relation between flows and performance documented in prior work using U.S. and international data (see Ippolito (1992), Sirri and Tufano (1998), Ferreira et al. (2012), and Spiegel and Zhang (2013)) also creates incentives for fund managers to earn excess returns since large inflows imply that the managers can earn the fixed management fee as a fraction of a larger asset base. However, the incentives are clearly much steeper when the fund management companies can earn a fraction of the outperformance directly. Moreover, future inflows are also susceptible to changes in market conditions over which the manager has little control, thereby further diminishing the strength of the flow-related incentive. While it is the case that the performance fees do not get paid directly to the fund manager but to the management company instead, the increased revenues allow the company to pay larger salaries and bonuses to managers that perform very well. Of course, fund managers in non-PF funds can also be paid based on performance (see Ibert et al. (2018) and Ma et al. (2019)), but this additional compensation will come out of the pocket of the fund management company, while in the case of PF funds, the fund management company will actually receive larger revenues which can be shared with the fund manager.[8] These revenues can also be used to enhance the performance of the fund in other ways, such as by giving it preferential access to internal research or allocation of initial public offerings (see Gaspar et al. (2006)). These features may allow the fund management company to attract top talent and prevent the best managers from joining hedge funds (see Deuskar et al. (2011) for an analysis of mutual fund managers that join hedge funds).[9]

The drawback of charging performance fees is that PF contracts are complicated and contain a large number of features that may make it difficult for retail investors to understand. This may allow some fund complexes to introduce PF funds without benchmarks or with benchmarks that can easily be beaten, thereby earning extra fees for performance that is actually substandard, under the guise of creating improved incentives. These are exactly the concerns voiced by the UK and European regulators in their ongoing reviews of PF funds. A further drawback is that performance fees may induce risk taking, which we will study in detail in Section 3.4.

To study fund returns, we employ two measures. First, we compute the monthly objective-adjusted return as the return of the fund class minus the return of its Morningstar category benchmark (there are 122 Morningstar categories in our sample). We gather benchmark return indices from Datastream and translate all returns into Euros to make them comparable. Second, we compute each fund class i's alpha during period t as follows:

$$\alpha_{i,t} = R_{i,t} - R_{f,t} - \beta_{i,t-1} \cdot \left(R_{cat,t} - R_{f,t}\right), \tag{1}$$

where $R_{i,t}$ is the monthly Euro return of the fund class during month t, $R_{f,t}$ is the risk free rate during month t, proxied by the 3-month Euribor rate, $\beta_{i,t-1}$ is fund class i's beta relative to its Morningstar benchmark computed over the previous 36 months[10], and $R_{cat,t}$ is the return of the fund's Morningstar benchmark.[11]

Table 3 contains univariate statistics on fund performance. Each fund class/month is one observation. PF funds underperform their objective by 17.2 basis points per month, compared to underperformance of 12.1 basis for non-PF funds. Thus, while funds underperform their benchmarks, on average, a phenomenon that has been documented extensively in the literature (see, for example, Jensen (1968), Carhart (1997), and Fama and French (2010)), PF funds underperform other funds by an additional 5.2 basis points on a monthly basis, which cumulates to 63 basis points annually. The inferences using one-factor alpha as a performance benchmark are similar. To determine whether one of the two performance metrics should receive more weight, we study which one investors pay more attention to when directing future inflows (see Berk and van Binsbergen (2016)). As discussed in more detail in Section 3.5, we find that one-factor alpha receives slightly more weight than the objective-adjusted return.[12] We also compare PF funds with non-PF funds operated by families that offer at least one PF fund during the current or previous years. As illustrated at the bottom of the table, PF funds also underperform relative to other funds in PF families, but the magnitude of the underperformance is somewhat attenuated compared to all non-PF funds.

In Table 4, we explore whether these results continue to hold in a multivariate setting. We estimate regressions of monthly excess returns at the fund/class level, measured as either objective-adjusted return or one-factor alpha. We include year dummies and Morningstar investment objective dummies, controls for fund and fund complex size, and we also include a dummy if the performance fees are capped. Standard errors in these specifications are clustered at the fund level and p-values are reported in parentheses.

In Panel A of Table 4, the key explanatory variable is a dummy equal to one if the fund is a PF fund. As illustrated in model (i) of Panel A, which includes investment objective and year fixed effects, PF funds underperform non-PF funds by 5 basis points per month, equivalent to 60 basis points per year. This effect declines only slightly in column (ii) where we control for fund and complex size and include an indicator variable if the fee is capped.[13] Performance is not related to the cap, but we find that funds perform better when they are larger and belong to larger fund families. The positive relation between size and performance is inconsistent with prior U.S. evidence (see Chen et al. (2004)), but consistent with international evidence (see Ferreira et al. (2013)), while

[8] Data on contracts between the fund manager and the fund management company do not need to be disclosed in Europe. As such, we are unable to study the extent to which performance fees are shared between the fund and the fund manager. From the perspective of the (potential) fund investors and regulators, regardless of whether and how performance fees are shared between the fund and the fund manager, it is important to assess whether or not PF funds earn excess returns, and whether the PF contract is structured in a way that aligns the interests of the fund and its investors.

[9] Starks (1987) compares contracts with symmetric and asymmetric performance fees. She concludes that symmetric contracts provide better incentives than asymmetric contracts with the same parameters since asymmetric contracts reduce downward risk, thereby reducing managerial effort. Moreover, the upside of asymmetric contracts leads to increased risk taking. Our discussion applies to a comparison of funds with performance fees to funds that do not charge performance fees, not to a comparison of funds with symmetric and asymmetric performance fees.

[10] We require at least 12 observations in the 36-month period to compute the beta.

[11] Because of the large diversity in funds, it is not feasible to include additional factors in the model. The funds in our sample, while domiciled in Europe, invest in equities of many countries around the world, many of which do not have available pricing factors. Note, however, that we compute betas relative to the underlying Morningstar category and not the market as a whole. As such, we are adjusting for the performance of the fund's investment objective, after taking into account the sensitivity of the fund's return relative to that objective.

[12] We thank an anonymous referee for suggesting this approach.

[13] There are fewer observations in this specification because fund size data are only available sporadically in the Morningstar Direct database during the early years of our sample period.

Table 3

Returns and fee comparisons between PF and non-PF funds. This table compares the monthly returns (in %) and annual expenses (in %) of PF and non-PF funds. For non-PF funds, we also report results for the subset of non-PF funds that are part of fund complexes that also offer PF funds. N funds is the number of fund/month observations. N fund classes is the number of fund/class/month observations. Returns are computed for each fund class separately. Objective-adjusted return is the monthly return of the fund minus the return of the fund's investment objective. Monthly alpha is computed as $R_{i,t} - R_{f,t} - \beta_{i,t-1} \bullet (R_{cat,t} - R_{f,t})$, where $R_{i,t}$ is the monthly Euro return of fund/class *i* during month *t*, $R_{f,t}$ is the risk free rate in month *t*, proxied by the 3-month Euribor rate, and $\beta_{i,t-1}$ is the fund/class's beta relative to its Morningstar benchmark computed over the previous 36 months (minimum 12 datapoints required). The Total expense ratio is the annual expense ratio as reported in Morningstar Direct, inclusive of any performance fee paid. *p*-values of *t*-tests of equality of the difference in returns/expenses between PF and non-PF funds to zero are in parentheses.

Type	N funds	N fundclasses	Objective-adjusted return	Alpha	Total expense ratio
Performance fees	84,708	170,586	-0.172%	-0.156%	2.18%
No Performance fees	1,016,662	1,992,272	-0.121%	-0.100%	1.75%
No Perf. fee in Perf. fee complex	421,570	878,518	-0.133%	-0.116%	1.73%
Δ (PF-No PF)			0.052%	0.057%	0.43%
			(0.00)	(0.00)	(0.00)
Δ (PF in PF fee complex - No PF)			0.039%	0.040%	0.45%
			(0.00)	(0.00)	(0.00)

Table 4

Performance regressions – comparing performance fee funds with other funds. This table presents regression models of monthly fund/class excess returns (in %) as a function of performance fee measures, an indicator if the performance fee is capped, the log of the size of the fund (in € millions), the log of the size of the fund complex (in € millions), and year and investment objective fixed effects. To capture performance fees, Panel A includes a dummy if the fund potentially charges a performance fee, and Panel B includes the potential performance fee level (as a decimal). In models (i) through (iii) of both panels, excess return is computed as the Morningstar objective-adjusted return, and in models (iv) through (vi) the excess return is computed as the alpha from a one-factor model, where the beta is estimated relative the fund's Morningstar benchmark computed over the prior 36 months (with a minimum of 12 required data points). *p*-values are in parentheses. Standard errors are clustered at the fund level. Models (iii) and (vi) are estimated only for fund families that offer both PF and non-PF funds.

Panel A: Performance Fee Indicator

	Objective-adjusted return			Alpha		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Performance Fee Indicator	-0.050 (0.00)	-0.045(0.00)	-0.020 (0.23)	-0.061 (0.00)	-0.060 (0.00)	-0.036 (0.03)
Cap Indicator		-0.007 (0.80)	0.005 (0.85)		0.021 (0.48)	0.030 (0.32)
Log Fund Size		0.014 (0.00)	0.018 (0.00)		0.019 (0.00)	0.023 (0.00)
Log Fund Complex Size		0.010 (0.00)	0.022 (0.00)		0.008 (0.00)	0.019 (0.00)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investment Objective FE	Yes	Yes	Yes	Yes	Yes	Yes
Standard errors clustered by	Fund	Fund	Fund	Fund	Fund	Fund
Only PF complexes	No	No	Yes	No	No	Yes
R^2	0.01	0.01	0.01	0.01	0.01	0.01
N	2,162,858	1,491,975	784,152	1,900,954	1,325,859	701,438

Panel B: Performance Fee Level

	Objective-adjusted return			Alpha		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Performance Fee Level	-0.256 (0.00)	-0.248 (0.00)	-0.140 (0.10)	-0.301 (0.00)	-0.313 (0.00)	-0.201 (0.01)
Cap Indicator		-0.008 (0.78)	0.010 (0.72)		0.020 (0.51)	0.034 (0.27)
Log Fund Size		0.014 (0.00)	0.018 (0.00)		0.019 (0.00)	0.023 (0.00)
Log Fund Complex Size		0.010 (0.00)	0.022 (0.00)		0.009 (0.00)	0.020 (0.00)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Investment Objective FE	Yes	Yes	Yes	Yes	Yes	Yes
Standard errors clustered by	Fund	Fund	Fund	Fund	Fund	Fund
Only PF complexes	No	No	Yes	No	No	Yes
R^2	0.01	0.01	0.01	0.01	0.01	0.01
N	2,160,205	1,491,022	783,333	1,898,340	1,324,918	700,631

the positive relation between performance and complex size confirms prior work in the U.S. (Chen et al. (2004)) and internationally (Ferreira et al. (2013)).[14] In column (iii) of Table 4, Panel A, we focus on families that offer PF funds during the current year or have offered PF funds in the past. Here, the coefficient on the PF dummy declines further and is no longer statistically significant. Thus, among families with PF funds, PF funds do not underperform on an objective-adjusted basis.

Columns (iv) through (vi) of Panel A of Table 4 repeat these analyses using alpha as a performance metric. In these models, underperformance increases to 6.1 basis points per month when including all funds, and 3.6 basis points per month when we focus on families with only PF funds. Importantly, the underperformance of PF funds within PF families is statistically significant in this specification.

In Panel B of Table 4, we repeat the previous analyses, but now include the PF level as the explanatory variable.[15] The results in this panel indicate that the returns of PF funds deteriorate further as the PF level increases. Depending on the specification and performance metric, increasing the performance fee from its 25th percentile (10%) to its 75th percentile (20%) reduces monthly returns by between 1.4 and 3.1 basis points.

Since the unit of observation in our analyses is a fund/class/month, those funds with more classes receive more weight in the reported

[14] See also Pástor et al. (2015) who report no significant evidence of decreasing returns to scale in the US fund industry after making adjustments for the endogeneity of fund size.

[15] Note that we have fewer observations in Panel B of Table 4 compared to Panel A, because in a few instances, we do not have information on the magnitude of the performance fee.

Table 5

Performance regressions – manager fixed effects. This table presents regression models of monthly fund/class/manager excess returns (in %) as a function of a performance fee dummy, an indicator if the performance fee is capped, the log of the size of the fund (in € millions), the log of the size of the fund complex (in € millions), and year and investment objective fixed effects. Models (i) and (iii) also contain fund manager fixed effects and models (ii) and (iv) contain manager-by-year fixed effects. In models (i) and (ii), excess return is computed as the Morningstar objective-adjusted return, and in models (iii) and (iv) the excess return is computed as the alpha from a one-factor model, where the beta is estimated relative the fund's Morningstar benchmark computed over the prior 36 months (with a minimum of 12 required data points). *p*-values are in parentheses. Standard errors are clustered at the fund level.

	Objective-adjusted return		One-factor alpha	
	(i)	(ii)	(iii)	(iv)
Performance Fee Indicator	-0.057 (0.03)	-0.044 (0.03)	-0.083 (0.00)	-0.062 (0.00)
Cap Indicator	0.009 (0.84)	0.009 (0.84)	0.051 (0.25)	0.030 (0.50)
Log Fund Size	-0.013 (0.00)	0.002 (0.62)	-0.006 (0.06)	0.011 (0.00)
Log Fund Complex Size	0.001 (0.81)	0.013 (0.01)	0.007 (0.12)	0.022 (0.00)
Year FE	Yes	No	Yes	No
Manager FE	Yes	No	Yes	No
Manager-by-Year FE	No	Yes	No	Yes
Investment Objective FE	Yes	Yes	Yes	Yes
Standard errors clustered by	Fund	Fund	Fund	Fund
R^2	0.02	0.10	0.03	0.09
N	1,263,855	1,263,855	1,133,698	1,133,698

regressions. To assess whether this affects our inferences, we repeat all our analyses using two approaches. First, we estimate all regression models using only the oldest class of each fund. Second, we estimate all regression models using weighted least squares (WLS), where the weight is the inverse of the number of fund classes. As such, each fund receives the same weight in this approach. These procedures have a small effect on the economic significance of our findings, but they remain economically large. For example, the coefficient on the PF dummy in model (v) of Panel A of Table 4 becomes –0.048 (*p*-value=0.00) when using the oldest fund class, and –0.052 (*p*-value=0.00) when using WLS compared to –0.060 in the table. All subsequent inferences remain essentially unchanged when we apply these alternative approaches.

Another concern is that we give each fund/class the same weight, independent of its size. Thus, the poor performance of PF funds could be due to a number of very small funds. To assess whether this is the case we again estimate WLS regressions, but this time we use the size of the fund as the weight. These models (not tabulated) yield underperformance that is more substantial than documented in Table 4: objective-adjusted returns are 7.8 to 8.4 basis points lower per month, depending on the specification, while one-factor alphas are 8.1 to 8.3 basis points lower. These findings indicate that the underperformance of PF funds is even worse in the largest funds.

Overall, the findings described in Tables 3 and 4 indicate that PF funds as a whole underperform relative to non-PF funds. It is possible, however, that there are inherent unobservable differences between PF funds and non-PF funds that lead to the differences in returns that we document. Unfortunately, we cannot estimate models with fund fixed effects because few funds change their PF status over their lives, and therefore models with fund fixed effects have little power. However, we can control for a very important attribute of performance, namely managerial ability, through the inclusion of manager fixed effects. To assess whether differences in managerial ability explain the underperformance of PF funds, we gather data on the manager history for all the funds in our sample from Morningstar Direct. Not all funds disclose the identity of the manager(s) and a number of funds mention that they are "team managed", without disclosing individual manager names, which reduces the sample by 30% compared to our base case models. We also remove funds when they list more than ten individuals as portfolio managers at a given point in time because we would not expect individual managers to have much impact on the performance of these funds.[16] We then restructure our dataset such that each fund/class/manager/month constitutes one observations; as such funds with multiple managers appear in the data several times. This structure allows us to re-estimate the models of Table 4 after including manager fixed effects, thereby holding managerial quality constant. There are 8,593 different fund managers in our sample. For sake of brevity, we report the models that include all control variables and that are estimated for all fund families.

Table 5 contains the results. Model (i) uses objective-adjusted return and model (iii) uses one-factor alpha as the dependent variable. Fund managers that run multiple funds perform better in the non-PF funds compared to the PF funds and the PF effect is even larger economically than in the base-case specifications reported in Table 4. Thus, the PF dummy is not capturing unobservable managerial quality. In models (ii) and (iv) we further saturate the model with manager-by-year fixed effects, so that we can compare managers that run PF and non-PF funds *at the same time*. While the underperformance of PF funds is somewhat attenuated in these models relative to models (i) and (iii), it remains large economically, translating into annual underperformance of at least 50 basis points. In sum, the evidence reported in Table 5 indicates that our findings are not due to differences in quality between PF and non-PF fund managers. Moreover, these results do not support the view that the incentives associated with PF contracts lead to superior investment outcomes. In the next subsection, we study the specific nature of the PF contracts in greater detail to better understand the causes of this subpar performance.

3.2. The relation between returns and performance fee contract features

Our prior discussion and the descriptive statistics reported in Table 2 indicate that PF funds may have many different features such as stochastic benchmarks, hurdle rates, and HWMs. In this section, we explore whether the excess returns earned by PF funds are related to these features. To that end, we repeat the analyses of Panel A of Table 4, but replace the PF dummy by eight different dummies that capture various elements of the PF contracts. The groups are based on whether the PF fund under consideration has a stochastic benchmark, a hurdle, and/or a HWM. These three features combined yield eight different combinations.[17]

[16] Our results persist if we do not exclude these funds from our analyses, or if we remove funds with multiple managers completely.

[17] An alternative way of estimating these specifications would be to include three dummies to capture the three possible performance elements (stochastic benchmark, hurdle, HWM). The advantage of our specification is that it allows the effect of one of the elements to depend on whether the other elements are present or not. This turns out to be important; for example, hurdles are important for funds without a stochastic benchmark, but not for funds with a stochastic benchmark.

Table 6

Regression of fund performance as a function of various aspects of the performance fee contract. This table presents regression models of fund performance (in %) as a function of eight dummies that capture various aspects of PF fund contracts. The eight dummies represent various combinations of three features of PF funds: (i) whether the fund has a stochastic benchmark or not; (ii) whether the fund has a hurdle or not; (iii) whether the fund has a HWM or not. The absence or presence of these features is displayed in columns (i) through (iii). Column (iv) displays the percentage of total PF fund assets invested in each combination, computed as the annual average over the sample period. Column (v) displays the total assets invested in each combination in December 2010. Columns (vi) through (xi) show the coefficients on the eight dummies. They measure the difference between the excess return of PF funds with the features displayed in the first three columns and non-PF funds. The coefficients in columns (vi) through (viii) employ objective-adjusted returns as the measure of performance, and columns (ix) through (xi) employ one-factor alphas. Columns (vi) and (ix) are based on regressions with year and objective dummies, while columns (vii), (viii), (x), and (xi) include all control variables (a capped fee dummy, log of fund size, log of fund complex size). The coefficients on the control variables are not displayed. The models in columns (viii) and (xi) are estimated only for families that offer PF funds or have offered PF funds in the past. *p*-values are in parentheses.

						Objective-adj. return			Alpha		
	(i) Stoch Benchm	(ii) Hurdle	(iii) HWM	(iv) Avg. % PF mkt	(v) Size €bn	(vi) Year/obj controls	(vii) All controls	(viii) All controls	(ix) Year/obj controls	(x) All controls	(xi) All controls
(a)	Yes	Yes	Yes	1.8%	1.1	-0.159 (0.01)	-0.150 (0.06)	-0.132 (0.09)	-0.186 (0.00)	-0.209 (0.01)	-0.197 (0.02)
(b)	Yes	Yes	No	1.7%	2.5	-0.163 (0.14)	-0.168 (0.21)	-0.126 (0.27)	-0.180 (0.11)	-0.158 (0.27)	-0.123 (0.31)
(c)	Yes	No	Yes	34.6%	35.2	-0.024 (0.24)	-0.024 (0.35)	-0.011 (0.69)	-0.040 (0.04)	-0.043 (0.09)	-0.029 (0.25)
(d)	Yes	No	No	39.9%	80.0	-0.021 (0.22)	0.004 (0.81)	0.024 (0.29)	-0.034 (0.03)	-0.011 (0.56)	0.010 (0.60)
(e)	No	Yes	Yes	5.9%	4.0	0.142 (0.00)	0.112 (0.08)	0.147 (0.02)	0.085 (0.11)	0.047 (0.50)	0.095 (0.20)
(f)	No	Yes	No	12.1%	10.8	-0.091 (0.01)	-0.133 (0.00)	-0.078 (0.11)	-0.092 (0.02)	-0.130 (0.01)	-0.079 (0.14)
(g)	No	No	Yes	2.0%	3.2	-0.186 (0.00)	-0.174 (0.00)	-0.114 (0.07)	-0.131 (0.00)	-0.124 (0.07)	-0.062 (0.36)
(h)	No	No	No	2.0%	7.5	-0.188 (0.00)	-0.206 (0.00)	-0.159 (0.03)	-0.198 (0.00)	-0.227 (0.00)	-0.178 (0.01)
R^2						0.01	0.01	0.01	0.01	0.01	0.01
N						2,162,702	1,491,900	784,125	1,900,798	1,325,784	701,411
Only PF families						No	No	Yes	No	No	Yes

In Table 6, we display the regression coefficients for each of the eight groups, listed in rows (a) through (h). They represent the difference in returns between the PF funds with the features displayed in the first three columns and non-PF funds. Column (iv) contains the average fraction of the PF market represented by the funds in each category, computed as the average over the sample period, while column (v) lists the total assets under management in each category as of December 2010. The coefficients in columns (vi) through (viii) are based on regressions using objective-adjusted returns as the measure of performance, and columns (ix) through (xi) are based one-factor alphas. Columns (vi) and (ix) are based on regressions with year and objective dummies, while columns (vii), (viii), (x), and (xi) include all control variables (a capped fee dummy, log of fund size, log of fund complex size). The coefficients on the control variables are not displayed. The models in columns (viii) and (xi) are estimated only for families that offer PF funds or have offered PF funds in the past.

Note that close to 75% of all PF fund assets fall into two categories (rows (c) and (d)); both have a stochastic benchmark, while category (c) also has a HWM and (d) has not. Neither of these categories has a hurdle in addition to the benchmark. Interestingly, there is only limited evidence of underperformance in these two categories; only for models of alpha do we find some indication of underperformance for funds with a stochastic benchmark and HWMs (row (c)).

The poor performance of PF funds documented in Table 4 appears to be concentrated in a number of categories with different features. In particular, three of the four groups of funds without a stochastic benchmark perform very poorly (rows (f) through (h)), with the worst performance being in the category of funds that have no targets at all (row (h)). These funds, with combined assets in excess of €21 billion in 2010, essentially earn performance fees when their returns exceed zero. After including all controls, these funds underperform non-PF funds by over 20 basis points per month, which is close to 2.5% per year compounded. If the funds without a stochastic benchmark have a hurdle or a HWM, their returns are slightly better, but they continue to underperform by at least 12 basis points per month when compared to non-PF funds. Only when we compare these PF funds to non-PF funds offered by PF families is the magnitude of poor performance reduced, and no longer statistically significant when alpha is employed as a return metric. Interestingly, funds without a stochastic benchmark, but with both a hurdle and a HWM show evidence of outperformance of 11 basis points or more using objective-adjusted returns as a performance metric. These funds obviously do not fit the prior narrative and require further analysis, which we will do when studying the magnitude of the hurdle rates.

The remaining two groups, whose excess returns are displayed in rows (a) and (b) of the table, both have stochastic benchmarks and hurdles, but one has a HWM and the other does not. Both sets of funds perform poorly, but the effect is estimated less precisely for the group without HWMs. For funds with HWMs (and the two other features), returns are virtually the same as for the funds that have no benchmarks at all, cumulating to more than 2% of underperformance per year. This result appears counterintuitive, as we previously ascribed part of the poor performance of some PF funds to their lack of a stochastic benchmark. One potential explanation for this result is that these funds set themselves a benchmark that is easy to beat and not in line with their investment objective. To study this conjecture in detail, we focus on the subset of PF funds that have a stochastic benchmark and estimate a regression of the return of the benchmark as a function of year and objective dummies and dummies that capture the other contractual features of these funds. Specifically, we estimate the following model using monthly data:

$$\begin{aligned} PF \quad & \mathit{Benchmark\ return}_{i,t} \\ & = b_1(\mathit{Hurdle\ and\ No\ HWM}) + b_2(\mathit{No\ Hurdle\ and\ HWM}) \\ & + b_3(\mathit{No\ Hurdle\ and\ No\ HWM}) + \mathit{Objective\ dummies} \\ & + \mathit{Year\ dummies} \end{aligned} \tag{2}$$

The benchmark return is the monthly return on the PF benchmark chosen by the fund. The omitted category is the group that has both a hurdle and a HWM (row (a) in Table 6). Thus, the beta coefficients in the above regression capture the difference between the returns on the benchmarks chosen by funds with both a hurdle and a HWM and the other funds, holding the investment objective and the year constant.

We present these results in Table 7. The findings are striking. The stochastic benchmarks returns of funds with both a hurdle and a HWM are significantly lower (i.e., the coefficients are all positive) than the benchmarks of the funds that have none or only one of these features, and two of the three differences are statistically significant. For example, funds without a hurdle and a HWM have a benchmark return that is 17.8 basis points higher on a monthly basis compared to funds with a hurdle and a HWM. These findings suggest that one possible reason why funds with a stochastic benchmark, a hurdle, and a HWM (row (a) of Table 6) underperform is because the benchmark they have chosen is easy to beat

Table 7
Regression of the stochastic benchmark return as a function of other contractual features. This regression is estimated only for PF funds that have a stochastic benchmark. The dependent variable is the monthly return on the benchmark set for the PF fund/class (in %). The explanatory variables are three dummies that capture combinations of the other two contractual features (Hurdle and HWM). The omitted category consists of funds with a Hurdle and a HWM. All models include year and objective fixed effects. Standard errors are clustered at the fund level. *p*-values are in parentheses.

	(i)
Hurdle and No HWM	0.254 (0.01)
No Hurdle and HWM	0.137 (0.11)
No Hurdle and No HWM	0.178 (0.05)
Year FE	Yes
Investment Objective FE	Yes
Standard errors clustered by	Fund
R^2	0.15
N	121,941

relative to other funds that have a stochastic benchmark but do not have one or both of the other features (HWM and hurdle). These results indicate that the actual benchmark chosen to assess whether funds have outperformed and can charge a performance fee has an important impact on the performance itself. While having a performance fee is supposed to attract more effort and better managers, if benchmarks are poorly chosen and do not reflect the returns of the fund's investment objective, these suggested benefits are unlikely to materialize.

To shed additional light on the performance targets chosen by PF funds, we perform an exercise similar to the one above focusing on the hurdle rate chosen by PF funds. That is, for the subset of PF funds with hurdle rates, we assess whether the absence or presence of other contractual features affects the magnitude of the hurdle. To this end, we estimate the following regression using monthly data:

$$\begin{aligned} Hurdle\ return_{i,t} &= \beta_1(Stochastic\ benchmark\ and\ No\ HWM) \\ &+\beta_2(No\ stochastic\ benchmark\ and\ HWM) \\ &+\beta_3(No\ stochastic\ benchmark\ and\ No\ HWM) \\ &+Objective\ dummies + Year\ dummies \end{aligned} \tag{3}$$

Hurdle return is the monthly return on the hurdle chosen by the PF fund. The omitted category is the group that has both a stochastic benchmark and a HWM.

The results are reported in Table 8. We find stark differences in hurdle rates depending on whether the funds have other features. Funds that have no stochastic benchmark have hurdle rates that are between 23 and 37 basis points higher per month than funds with a stochastic benchmark. This result is entirely reasonable: without a stochastic benchmark, funds may deem it necessary to set higher hurdle rates before performance fees can be earned. Interestingly, the funds without a stochastic benchmark that have the highest hurdles are the ones with a HWM, and these are the only funds for which there is some suggestion of excess performance relative to non-PF funds (see Table 6). Setting a high hurdle appears to be positively related to performance, but this does not imply that it is a good substitute for setting a stochastic benchmark that needs to be exceeded.

Table 8
Regression of the hurdle rate as a function of other contractual features. This regression is estimated only for PF funds that have a hurdle. The dependent variable is the monthly return on the hurdle set for the PF fund/class (in %). The explanatory variables are three dummies that capture combinations of the other two contractual features (stochastic benchmark and HWM). The omitted category consists of funds with a Stochastic Benchmark and a HWM. All models include year and objective fixed effects. Standard errors are clustered at the fund level. *p*-values are in parentheses.

	(i)
Stochastic Benchmark and No HWM	0.003 (0.95)
No Stochastic Benchmark and HWM	0.367 (0.00)
No Stochastic Benchmark and No HWM	0.233 (0.00)
Year FE	Yes
Investment Objective FE	Yes
Standard errors clustered by	Fund
R^2	0.29
N	27,335

In sum, the analyses of returns in this section indicate that PF funds underperform non-PF funds, but that the poor performance of PF funds is concentrated in funds that have no stochastic benchmark, and no or a low hurdle as well as in funds that do have a stochastic benchmark, but one that is easy to beat. The majority of funds have a stochastic benchmark and no hurdle and for this group of funds, there is little evidence of underperformance, consistent with the work of Ma et al. (2019). However, our results do not support the notion that PF funds, in general, irrespective of the PF mechanism, have stronger incentives and are therefore able to attract better managers whose interests are more closely aligned with those of fund investors. In fact, since PF fund underperformance continues to hold after controlling for managerial ability, it appears to be the structure of the contract itself that is related to the poor performance for a subset of funds.

3.3. Expenses

In this section, we study the expense ratios of PF funds. One alleged advantage of PF funds is that they can charge lower management fees and more than make up the difference by earning performance fees. Fidelity International, for example, when implementing symmetric performance fees across all its actively managed funds in 2017, lowered all the management fees by 10 basis points. Its performance fee is 10% of excess performance, up to a maximum of 20 basis points. Thus, Fidelity will earn fees equal to its prior management fee only if it outperforms its benchmark by 1% annually.

Unfortunately, historical data on management fees are not available on Morningstar Direct; the database only contains historical information on the Expense ratio, which also includes the performance fee itself, if charged. However, examining the expense ratio can still shed light on the costs of PF funds. The results documented in Section 3.2. indicate that several subsets of PF funds underperform non-PF funds. If fund investors benefit from lower management fees when PF funds underperform, we would expect their overall expense ratios to be lower than those of non-PF funds. On the other hand, if their management fees are not lower and/or if they charge performance fees even when underperforming their Morningstar category because the PF contract is poorly designed, then we would expect the overall expense ratio to be higher.

In the last column of Table 3, we compare average annual expense ratios of PF and non-PF funds. PF funds have average expense ratios of 2.18%, which is significantly higher than the 1.75% for non-PF funds, and the 1.73% for non-PF funds in families that also offer PF funds. These figures indicate that while PF funds underperform non-PF funds, their fees are not lower. In fact, the gap in expenses between PF and non-PF funds of 0.43% covers a substantial fraction of the gap in performance documented previously.

In Table 9, we ascertain whether these univariate results continue to hold in a multivariate setting where we control for other factors that may affect expenses. In particular, we estimate regression models of annual expenses at the fund class level as a function of a PF dummy, and include year and Morningstar objective fixed effects, and a dummy set equal to one if the fund is an index fund.[18] In some specifications, we also include a dummy if the performance fee is capped, and controls for the size of both the fund and the fund complex. Model (i) indicates that the expense ratio of PF funds is 35 basis points higher than for non-PF funds after controlling for time and Morningstar investment

[18] All the findings reported in the table continue to hold when we remove index funds. Not surprisingly, none of the PF funds are index funds.

Table 9

The relation between expenses and potential performance fees. This table contains regression models of annual fund expenses (in %) at the fund/class level as a function of a dummy variable equal to one if the fund potentially charges performance fees, an index fund indicator, a dummy if the performance fee is capped, the log of fund size (in € millions), the log of fund complex size (in € millions), year and investment objective fixed effects. Standard errors are clustered at the fund level. *p*-values are in parentheses.

	(i)	(ii)	(iii)
Performance Fee Indicator	0.35 (0.00)	0.34 (0.00)	0.29 (0.00)
Index Fund Indicator	-0.88 (0.00)	-0.87 (0.00)	-0.87 (0.00)
Cap Indicator		0.01 (0.88)	0.00 (0.95)
Log Fund Size		-0.07 (0.00)	-0.06 (0.00)
Log Fund Complex Size		-0.05 (0.00)	-0.07 (0.00)
Year FE	Yes	Yes	Yes
Investment Objective FE	Yes	Yes	Yes
Standard errors clustered by	Fund	Fund	Fund
Only PF complexes	No	No	Yes
R^2	0.13	0.18	0.18
N	93,866	85,698	47,804

Table 10

The relation between expenses and various aspects of performance fee contracts. This table presents regression models of fund expenses (in %) as a function of eight dummies that capture various aspects of PF fund contracts. The eight dummies represent various combinations of three features of PF funds: (i) whether a fund has a stochastic benchmark or not; (ii) whether a fund has a hurdle or not; (iii) whether a fund has a HWM or not. The absence or presence of these features is displayed in columns (i) through (iii). Columns (iv) through (vi) show the coefficients on the eight dummies. They measure the difference between the expense ratio of PF funds with the features displayed in the first three columns and non-PF funds. The model reported in column (iv) includes year and objective fixed effects and a dummy if the fund is an index fund (not displayed). The models in columns (v) and (vi) also control for the log of fund and complex size (in € millions) and whether performance fees are capped. The coefficients on the control variables are not displayed. The model in column (vi) is estimated only for families that offer PF funds or have offered PF funds in the past. *p*-values are in parentheses.

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
	Stochastic Benchmark	Hurdle	HWM	Regression coefficients		
				Year/Obj. controls	All controls	All controls Only PF families
(a)	Yes	Yes	Yes	0.24 (0.02)	0.29 (0.00)	0.24 (0.02)
(b)	Yes	Yes	No	0.37 (0.00)	0.32 (0.00)	0.22 (0.05)
(c)	Yes	No	Yes	0.24 (0.00)	0.29 (0.00)	0.25 (0.00)
(d)	Yes	No	No	0.29 (0.00)	0.29 (0.00)	0.24 (0.00)
(e)	No	Yes	Yes	0.44 (0.01)	0.37 (0.02)	0.31 (0.05)
(f)	No	Yes	No	1.25 (0.00)	1.14 (0.00)	1.09 (0.00)
(g)	No	No	Yes	0.85 (0.00)	0.59 (0.00)	0.51 (0.00)
(h)	No	No	No	0.51 (0.00)	0.40 (0.00)	0.34 (0.00)
R^2				0.14	0.18	0.18
N				93,863	85,695	47,802

objectives. While smaller than in the univariate statistics, this difference remains substantial and can explain a significant portion of the underperformance documented previously. We also report that passively managed index funds are 88 basis points cheaper than other funds. In model (ii), we add additional controls for size and whether the fund's performance fee is capped. Fees are not related to whether the performance fee is capped. Size, on the other hand, is negatively related to fees, both at the fund level and the fund complex level. To illustrate the economic importance of this finding, moving fund size from its 25th to its 75th percentile reduces expenses by 16 basis points, while moving fund complex size from its 25th to its 75th percentile reduces expenses by 13 basis points. Importantly, while adding these additional controls improves the explanatory power of the model, the coefficient on the PF indicator remains virtually unchanged and highly significant. In model (iii), we limit the analysis to fund families that offer at least some PF funds. Even within this subsample, we find that PF funds are 29 basis points more expensive than non-PF funds.

The results on performance in Table 6 indicate that there are substantial return differences across different types of PF funds depending on the specific features of the funds. In Table 10, we study whether the expense ratios of PF funds are also related to these features. There are two phenomena at play that could affect expenses. Holding actual performance constant, funds without a stochastic benchmark or with a benchmark that is easy to beat should earn higher performance fees, and without offsetting management fees, will have higher expenses overall. However, if funds set a low or no benchmark, the actual incentives to perform well are likely also reduced, which could offset this effect.

The figures reported in Table 10 are differences in annual expenses between non-PF funds and PF funds with the features listed in the first three columns, based on regression models with dummies for various subcategories of PF contract features, after including various controls. In column (iv), we include year and objective fixed effects and an index fund dummy. In column (v), we further control for fund and complex size and for whether the performance fee is capped. Column (vi) also includes all the controls, but is only estimated for families that offer PF funds. Several results stand out. First, all the PF subcategories have higher expense ratios than non-PF funds. Based on column (v), which includes all controls, the difference in expenses ranges from 0.29% to 1.14%. Second, funds without a stochastic benchmark (rows (e) through (h)) have higher expense ratios than funds with a stochastic benchmark (rows (a) through (d)), which suggests that it may be easier for such funds to earn their performance fee. Third, within this group of funds without a stochastic benchmark, two categories stand out in terms of the magnitude of their expenses: funds with a hurdle and no HWM (row (f)) and funds with no hurdle and a HWM (row (g)). Based on the regression model that includes all the controls (column (v)), funds in the first category have expenses ratios that are 1.14% above those of non-PF funds, while funds in the second category have expense ratios 0.59% higher. Both of these are significantly higher than the expense ratios of the funds in the other subcategories; this may also explain why their net returns are particularly poor. Our inferences are the same if we focus on the coefficients in column (vi), which is restricted to families with PF funds.

While we conjecture that PF funds are more expensive than other funds partly because the expense ratio includes a performance fee, we have no historical data on the management fee to verify whether this is indeed the case. As an approximation we use the most recently available management fee data item from Morningstar Direct. Using this data item, we estimate regressions of management fees as function of a PF indicator and control variables. The findings are reported in the Internet Appendix. There are essentially no differences in management fees between PF and non-PF funds, which implies that the differences in expense ratios documented in Tables 9 and 10 are either due to the performance fee element of expenses or to other administrative expenses incurred in operating the fund (e.g., custodian fees). The lack of a difference in management fees between PF and non-PF funds is also noteworthy because it does not support the view that PF funds charge lower management fees in exchange for the potential upside from performance fees. On average, investors pay the same management fee whether the fund charges performance fees or not. Since these findings are based on the most recent management fee and not historical data, these results should be interpreted with caution, however.

Overall, our analysis of the expenses and management fees indicates that PF funds are more expensive than non-PF funds, which is likely due the performance fee component imbedded in expenses. Management fees appear to be similar across both fund types. For funds without a stochastic benchmark (rows (e) through (h)), these fee differences are so large that they lead to the underperformance documented in Section 3.1., suggesting that for this subset of funds, the PF structure may serve as a mechanism for extracting fees from investors under the guise of improved alignment of investor and fund manager interests. For funds with a stochastic benchmark, the excess fees are smaller such that net performance is not significantly different from zero, except for funds in row (a) for which we already know that they set a benchmark that is easy to beat.

To further assess the merits of this explanation, we repeat our base case models reported in Table 4, after adding one-twelfth of annual expenses to the net returns. The results on gross returns are reported in the Internet Appendix. Not surprisingly, given the magnitude of the expenses documented previously, the evidence of underperformance based on gross returns is a lot weaker, independent of whether we employ the performance fee dummy or the performance fee level. In fact, there is no evidence of underperformance at all when we consider objective-adjusted return as a performance measure, while the level of underperformance declines by half based on alpha. In addition, it is not significant for the subset of families that offer both PF and non-fund PF funds. These findings support our conjecture that the PF structure is employed by a subset of funds to extract additional fees from investors without delivering superior performance. The upside, as pointed out earlier, is that the fraction of all PF funds invested in these problem categories is modest.

3.4. Risk taking

In this section we compare the risk profile of PF funds and non-PF funds. Several theoretical papers analyze risk taking incentives arising from PF contracts in different settings (Grinblatt and Titman (1989); Carpenter (2000); Goetzman et al. (2003)). The general conclusion is that the portfolio manager has an incentive to increase the total risk of the portfolio, particularly if the PF contract is asymmetric. In fact, Grinblatt and Titman (1989) recommend imposing caps and including penalties for poor performance, thereby making the PF contract symmetric, to overcome these risk taking incentives. The risk taking incentives associated with PF contracts have also been echoed by practitioners over time (see, for example, Kritzman (1987)). Elton, et al. (2003) provide evidence that US funds with symmetric performance fees are indeed riskier than matched non-PF funds.

In addition to the overall effect on the riskiness of the portfolio, performance fees could also affect how fund managers change risk over their assessment period, depending on their intermediate return performance relative to the PF benchmark. There are two distinct arguments made in the literature. The first suggests that if the fund's performance in the middle of an assessment period is below the threshold required to earn performance fees, managers may be tempted to increase risk in the second half of the period. However, Basak et al. (2007) show that the intuition that poorly performing fund managers are always tempted to increase risk does not always hold. While their setting does not account for explicit performance fees, the convex flow-performance relation creates an incentive to be the winner even without explicit performance fees.[19] Basak et al. (2007) argue that managers with poor performance during the assessment period have an incentive to deviate more from the benchmark against which they are being assessed. This does not need to be achieved through increased risk taking, but could also be achieved by decreased risk taking, an option which may well be preferable for fund managers that are more risk averse.[20] Elton, et al.'s work (2003) supports the view that PF funds increase risk in response to poor performance: using PF funds whose performance fee is measured over a 3-year horizon, they find that the funds in the bottom performance quintile after two years increase risk significantly in the third year relative to funds in the top quintile. Since their study comprises symmetric PF funds only, the effect of asymmetric performance fees could be even more substantial, as such funds face less downside from increasing risk.

The second argument to explain changes in risk over the year is based on the notion that at least some fund managers themselves are compensated for outperforming the competition. Using recently available data on the actual compensation contracts of fund managers in the US, Lee et al. (2019) find that managers with asymmetric performance-based contracts are more likely to increase risk in the second half of the year if their first half-year performance is closer to the compensation benchmark. This is where the sensitivity of compensation relative to risk taking (the vega of the implied option) is the largest. We will investigate both of these arguments.

We start our analysis of the risk profile of PF funds by comparing the volatility of PF and non-PF funds in a multivariate setting. We compute the standard deviation of monthly returns for each fund/class on an annual basis, requiring 12 observations for the fund to be included in this analysis. We then estimate various regression models of volatility as a function of a PF dummy and various controls as well as year and objective fixed effects. These findings are reported in Panel A of Table 11. Model (i) includes an index fund dummy as a control as well as year and investment objective fixed effects. In model (ii), we add controls for fund and complex size and a dummy if the potential performance fee is capped. Model (iii) has the same explanatory variables as model (ii) but is estimated only for families that offer PF funds. Across all three models, our inferences are the same: there is essentially no difference between PF funds and non-PF funds in terms of overall risk taking. Thus, the concern voiced in the press and by

[19] Spiegel and Zhang (2013) argue that market share is a better metric to capture the response of assets under management to performance compared to flows because the flow response of individual funds to performance is heterogeneous, which could erroneously lead to false estimates of convexity in the relation. Using market share, Spiegel and Zhang (2013) find a linear relation between flow and performance. The lack of convexity would remove risk-taking incentives unless high-performing funds have spillover effects for other funds in the family (see Nanda et al. (2004)).

[20] See Brown et al. (1996), Chevalier and Ellison (1997), Busse (2001), and Reed and Wu (2005) for work on risk-shifting behavior in the mutual fund industry.

Table 11

Analysis of the volatility of PF funds relative to non-PF funds. This table contains regression models of fund volatility (in %) at the fund/class level as a function of a dummy variable equal to one if the fund potentially charges performance fees, an index fund indicator, a dummy if the performance fee is capped, the log of fund size (in € millions), the log of fund complex size (in € millions), and year and investment objective fixed effects. In Panel A, fund volatility is computed as the standard deviation of raw returns over a year using monthly data on fund/class returns. In Panel B, we compute active risk as the standard deviation of objective-adjusted returns over a year using monthly data. Funds with less than 12 return observations in a given year are excluded from this analysis. The model in column (iii) of both panels is estimated only for families that offer PF funds or have offered PF funds in the past. Standard errors are clustered at the fund level. *p*-values are in parentheses.

Panel A: Standard Deviation of Raw Returns			
	(i)	(ii)	(iii)
Performance Fee Indicator	-0.00 (0.74)	0.02 (0.55)	0.04 (0.25)
Index Fund Indicator	-0.06 (0.00)	-0.06 (0.00)	-0.07 (0.01)
Cap Indicator		-0.20 (0.01)	-0.20 (0.01)
Log Fund Size		-0.03 (0.00)	-0.03 (0.00)
Log Fund Complex Size		0.03 (0.00)	0.03 (0.00)
Year FE	Yes	Yes	Yes
Investment Objective FE	Yes	Yes	Yes
Standard errors clustered by	Fund	Fund	Fund
Only PF complexes	No	No	Yes
R^2	0.64	0.66	0.66
N	175,826	126,941	66,143
Panel B: Standard Deviation of Objective-Adjusted Returns			
	(i)	(ii)	(iii)
Performance Fee Indicator	0.10 (0.00)	0.14 (0.00)	0.10 (0.01)
Index Fund Indicator	-0.62 (0.00)	-0.58 (0.00)	-0.65 (0.00)
Cap Indicator		-0.48 (0.00)	-0.50 (0.00)
Log Fund Size		-0.07 (0.00)	-0.08 (0.00)
Log Fund Complex Size		-0.07 (0.00)	-0.08 (0.00)
Year FE	Yes	Yes	Yes
Investment Objective FE	Yes	Yes	Yes
Standard errors clustered by	Fund	Fund	Fund
Only PF complexes	No	No	Yes
R^2	0.32	0.35	0.36
N	166,992	120,294	62,466

some regulators that PF fund structures are associated with greater risk for investors is not borne out in the data. In fact, the coefficient on the Cap Indicator is negative and significant (−0.20%), suggesting that PF funds with capped fees actually take less risk than other funds; this effect is small, however, relative to the average monthly volatility of the funds in our sample of 4.69%.

We have also examined whether various contractual features of PF funds affect risk, as we did for fees and performance (not reported in a table), and while we find some significant effects for some of the categories, the economic significance of these effects is generally quite small. We therefore conclude that PF funds are not riskier than non-PF funds.

Next we study whether PF funds take more active risk, computed as the standard deviation of objective-adjusted returns over the year. Thus, funds that simply hug their Morningstar benchmark would show active risk of zero. These results are displayed in Panel B of Table 11, and they indicate that PF funds do take more active risk relative to non-PF funds. According to model (ii), which contains all the controls, the active risk of PF funds is 0.14% higher than that of non-PF funds on a monthly basis. For the entire sample, active risk is 1.90%, which implies that PF funds' active risk is about 7% higher than that of non-PF funds. Note, however, that this effect is entirely due to funds whose performance fees are uncapped. PF funds whose fees are capped take a lot less active risk, suggesting that PF funds with capped fees have a tendency to act more like closet indexers.

Finally, we study whether PF funds increase their risk during the year when their performance mid-year is below what is required to earn a performance fee, or when the sensitivity of the change in performance fee to changes in risk (the vega of the option) is largest. For this analysis, we compare PF funds that have a one-year crystallization period (i.e., the period after which the performance fee is paid) to all non-PF funds. PF funds with crystallization periods different from one year are removed from this analysis. We compute three potential benchmarks against which the return of the fund is compared: (a) the return on the PF benchmark; (b) the return on the hurdle; and (c) the HWM. If the return on the fund is below the maximum of the three, we set an underwater dummy equal to one, which implies that if the fund remains on the same trajectory for the remainder of the year, it will not earn a performance fee. We also compute the absolute value of the difference between the return on the fund and the return that needs to be achieved to earn a performance fee (absolute difference from benchmark).

For all funds in our analysis, we measure both the change in the volatility of raw returns and the change in active risk. The change in the volatility of raw returns is computed as the standard deviation of returns in the second half of the year minus the standard deviation of returns in the first half. The change in active risk is computed as the standard deviation of objective-adjusted returns in the second half of the year minus this same standard deviation in the first half. We compute the standard deviation in this exercise using daily returns since we would only have six data points to compute semi-annual volatility with monthly data. To reduce the influence of outliers, we winsorize the volatility measures at their 1^{st} and 99^{th} percentiles before computing the difference. We then estimate regression models of the change in risk as a function of the performance fee dummy and either the underwater dummy or the absolute underwater level. As in all models, we include year and investment objective fixed effects. We also include a dummy if the performance fees are capped and if the fund is an index fund. Importantly, we control for the fund's performance rank relative to other funds in the same Morningstar category scaled from zero to one. This measure captures tournament effects that are potentially present in all funds where poorly performing funds increase risk to increase the likelihood of becoming a winner while funds with excellent performance decrease risk to safeguard their current ranking. Finally, we control for return volatility in the first half of the year to capture any mean reversion in risk-taking.

Our results are reported in Table 12. Models (i) and (ii) relate to the change in total risk, while models (iii) and (iv) focus on active risk. Model (i) shows that PF funds as whole reduce risk in the second half of the year by 2.1 basis points. This effect is economically insignificant, however, compared to median daily volatility of 1.1%. Consistent with general tournament effects, we find that funds with worse performance

Table 12

Risk changes over the year for PF and non-PF funds The dependent variable in columns (i) and (ii) is the daily return volatility in the period July-December minus the daily return volatility in the period January-June (in %). The dependent variable in columns (iii) and (iv) is the daily volatility of the objective-adjusted return in the period July-December minus the daily volatility of the objective-adjusted return in the period January-June. The volatility is winsorized at the 1st and 99th percentiles before computing the difference. Scaled Rank in Category is the fund's return rank within its Morningstar category over the period January-June, scaled from zero (worst performing) to 1 (best performing). Underwater Indicator is a dummy equal to one if the fund's return in the period January-June is lower than required to meet the maximum of (the performance benchmark return, the hurdle return, the HWM). Abs Diff from Benchmark is the absolute value of the difference between the return on the fund and the return that needs to be achieved to earn a performance fee. The analysis includes all non-PF funds and PF funds with a one-year crystallization period. Standard errors are clustered at the fund level. *p*-values are in parentheses.

	Change in total risk		Change in active risk	
	(i)	(ii)	(iii)	(iv)
Performance Fee Indicator	-0.021 (0.01)	0.011 (0.33)	-0.008 (0.56)	-0.002 (0.91)
Cap Indicator	-0.016 (0.27)	-0.025 (0.09)	-0.033 (0.04)	-0.039 (0.01)
Index Fund Indicator	0.023 (0.00)	0.023 (0.00)	-0.033 (0.00)	-0.033 (0.00)
Volatility Return Jan-June	-0.434 (0.00)	-0.435 (0.00)		
Vol Obj-Adj. Return Jan-June			-0.083 (0.00)	-0.083 (0.00)
Scaled Rank in Category	-0.044 (0.00)	-0.045 (0.00)	-0.053 (0.00)	-0.053 (0.00)
Underwater Indicator	0.010 (0.43)		-0.018 (0.36)	
Abs. Diff. from Benchmark		-0.489 (0.03)		-0.316 (0.28)
HWM Indicator	0.021 (0.26)	0.010 (0.60)	0.029 (0.20)	-0.009 (0.72)
HWM * Underwater Indicator	0.002 (0.94)		-0.023 (0.44)	
HWM * Abs. Diff from Benchmark		0.450 (0.05)		0.309 (0.30)
Year FE	Yes	Yes	Yes	Yes
Investment Objective FE	Yes	Yes	Yes	Yes
Standard errors clustered by	Fund	Fund	Fund	Fund
R^2	0.84	0.84	0.60	0.60
N	161,763	161,763	122,772	122,772

within their Morningstar category increase risk in the second half of the year, but economically this effect is small as well: firms in the 25th performance percentile increase daily risk by 2.2 basis points relative to funds in the 75th percentile.[21] There is no evidence, however, that funds that are under water relative to the PF threshold(s) increase risk in the second half of the year. We also study whether risk-taking incentives are attenuated by HWMs. In the context of hedge funds, Panageas and Westerfield (2009) show that a portfolio manager with a HWM faces a trade-off between (i) increasing the volatility of the fund and hence the value of the performance fee for the current period and (ii) lowering the volatility of the fund to increase the present value of future performance fees. In other words, a risky portfolio increases the likelihood of earning performance fees in the current period but it also increases the likelihood that the manager has to start the next period below the HWM threshold. For a sample of hedge funds, Aragon and Nanda (2012) provide evidence that HWMs deter risk-shifting incentives. The results reported in column (i) provide little support for this view for our sample. The underwater dummy, the HWM dummy, and the interaction between the two dummies are all insignificant.

In column (ii) we examine whether the change in risk is related to the sensitivity of the PF contract payoff to changes in risk. This sensitivity is largest when the difference between the performance of the fund and the return required to earn the performance fee is small. We find support for this prediction. The coefficient on the absolute difference from the benchmark is significantly negative, suggesting that risk-taking incentives are strongest when the performance fee contract is at the money and weakest when the contract is deep into or out of the money. The effect is also economically significant. Increasing the absolute underwater level by one standard deviation (15.3%) reduces the change in daily risk by 7.5 basis points (compared to median daily volatility of 1.1%). Interestingly, the interaction between the HWM dummy and the absolute difference from the benchmark is of similar magnitude and the opposite sign as the coefficient on the absolute difference from the benchmark itself. Thus, the increased risk taking incentives are almost completely offset for PF funds with a HWM, consistent with the notion that HWMs dampen risk-taking incentives.

The results on active risk, displayed in columns (iii) and (iv), do not yield any significant results, except that PF funds with capped fees experience a small reduction in active risk compared to other funds.[22] While the coefficient on the absolute difference from the benchmark in model (iv) is negative, it is smaller than in model (ii) and not statistically significant.

In sum, we find little evidence that PF funds are more risky than non-PF funds, but they do take more active risk. We also find little evidence to suggest that PF funds are more likely to change their risk in the middle of the year when their performance during the first half is not sufficient to reach the level at which performance fees are paid, but some limited evidence that PF funds increase risk when the sensitivity of changes in performance fees to changes in risk is largest. This evidence indicates that concerns about increased risk-taking due to the PF structure are not warranted.

3.5. Inflows and the flow-performance relation

Elton, et al. (2003) conjecture that PF funds may use the PF designation as a marketing gimmick to attract more inflows, as investors may (erroneously perhaps) believe that such funds are likely to perform better due to the improved alignment of the interests of investors and fund managers. They also report evidence consistent with this conjecture: PF funds grow 10 percentage points faster than non-PF funds after controlling for various other determinants of inflows. Alternatively, it could be that investors in PF funds are less sensitive to performance, allowing funds to deliver poor returns while charging higher fees, but without suffering outflows.[23] In this section, we investigate these conjectures in our setting, which includes a lot more funds that charge mainly asymmetric performance fees.

[21] Chevalier and Ellision (1997) document that risk-taking incentives are not necessarily linear in performance. We therefore also include a 5th order polynomial of the performance rank (not reported in the table). Our findings persist.

[22] Note that we have fewer observations for the analysis of the change in active risk because daily returns data on all the Morningstar objectives are not available.

[23] Frazzini and Lamont (2008) analyze fund flows in U.S. mutual funds and find that investors systematically direct their money to funds that invest in stocks with future low returns, a phenomenon they call the "dumb money" effect. The failure to withdraw money from underperforming PF funds would also be consistent with dumb money.

Table 13
Analysis of the flow-performance relation in PF and non-PF funds. The dependent variable is the fund inflow during year t, computed as$Inflow_{i,t} = (Assets_{i,t} - Assets_{i,t-1} \cdot (1 + R_{i,t}))/Assets_{i,t-1}$, expressed as a percentage, where $Assets_{i,t}$ refers to the total assets of the fund in Euros at the end of year t, and $R_{i,t}$ is the fund's return in Euros during year t. Objective inflow is computed as the weighted average inflow into all funds with the same Morningstar objective. Inflows are winsorized at the 1st and 99th percentiles. The performance quintile dummies are set equal to one if the fund's lagged one-factor alpha falls into the respective quintiles. The regression is estimated for the oldest class of the fund. The models in columns (iii) an (iv) are estimated only for families that offer PF funds or have offered PF funds in the past. *p*-values are in parentheses.

	(i)	(ii)	(iii)	(iv)
Performance Fee Indicator	-1.66 (0.32)	-9.23 (0.00)	-4.13 (0.02)	-12.97 (0.00)
Lag Log Fund Size	-12.82 (0.00)	-12.82 (0.00)	-11.83 (0.00)	-11.84 (0.00)
Objective inflow	0.75 (0.00)	0.75 (0.00)	0.72 (0.00)	0.72 (0.00)
Lag Stdev Monthly Returns$_{t-1}$	99.21 (0.01)	99.88 (0.02)	129.10 (0.01)	130.72 (0.01)
Performance Quintile 2 $_{t-1}$	4.97 (0.00)	4.16 (0.00)	4.71 (0.01)	2.88 (0.17)
Performance Quintile 3 $_{t-1}$	10.88 (0.00)	10.09 (0.00)	12.00 (0.00)	10.58 (0.00)
Performance Quintile 4 $_{t-1}$	12.81 (0.00)	12.01 (0.00)	10.82 (0.00)	8.83 (0.00)
Performance Quintile 5 $_{t-1}$	22.64 (0.00)	21.78 (0.00)	19.82 (0.00)	17.42 (0.00)
Perf Quintile 2 $_{t-1}$ * Perf. Fee Indicator		9.16 (0.02)		10.28 (0.01)
Perf Quintile 3 $_{t-1}$ * Perf. Fee Indicator		9.49 (0.05)		7.55 (0.12)
Perf Quintile 4 $_{t-1}$ * Perf. Fee Indicator		9.60 (0.02)		12.02 (0.01)
Perf Quintile 5 $_{t-1}$ * Perf. Fee Indicator		10.12 (0.02)		14.28 (0.00)
Year FE	Yes	Yes	Yes	Yes
Investment Objective FE	Yes	Yes	Yes	Yes
Standard errors clustered by	Fund	Fund	Fund	Fund
Only PF complexes	No	No	Yes	Yes
R^2	0.08	0.08	0.08	0.08
N	49,360	49,360	24,802	24,802

Table 14
Analysis of changes in performance fee contract features. Panel A shows estimates of a Linear Probability Model where the dependent variable is one if the firm removes a stochastic index as a benchmark in year t and zero otherwise. The explanatory variables are a dummy equal to one if the firm's return in year t-1 is below the stochastic PF benchmark (model (i)) or the return of the fund in year t-1 minus the return of the PF benchmark in year t-1 (model (ii)). Panel B shows estimates of a Linear Probability Model where the dependent variable is 1 if the firm reduces the magnitude of the hurdle in year t and zero otherwise. The explanatory variables are annual performance measures in year t-1 (objective-adjusted return in model (i) and one-factor alpha in model (ii). All models include year and investment objective fixed effects. *p*-values are in parentheses.

Panel A: Removing Stochastic Benchmark		
	(i)	(ii)
Return below index$_{t-1}$	0.0084 (0.02)	
PF benchmark adj. ret$_{t-1}$		-0.0005 (0.01)
Year FE	Yes	Yes
Investment Objective FE	Yes	Yes
Standard errors clustered by	Fund	Fund
R^2	0.04	0.04
N	9,257	9,257
Panel B: Reducing the Magnitude of the Hurdle		
	(i)	(ii)
Objective-adjusted return$_{t-1}$	-0.0016 (0.03)	
One-factor alpha$_{t-1}$		-0.0012 (0.12)
Year FE	Yes	Yes
Investment Objective FE	Yes	Yes
Standard errors clustered by	Fund	Fund
R^2	0.63	0.62
N	2,318	2,318

The basic framework for this analysis is the one proposed by Sirri and Tufano (1993). We compute inflows for fund i during year t as:

$$Inflow_{i,t} = \left(Assets_{i,t} - Assets_{i,t-1} \cdot \left(1 + R_{i,t}\right)\right) / Assets_{i,t-1}, \quad (4)$$

where $Assets_{i,t}$ refers to the total assets of the fund in Euros at the end of year t, and $R_{i,t}$ is the fund's raw return in Euros during year t. We estimate regression models of inflows as a function of a PF dummy and several control variables: (a) the lagged log of fund size, (b) the contemporaneous weighted average inflow in the fund's Morningstar objective, and (c) the standard deviation of the fund's monthly returns over the prior year. We also divide funds into five quintiles based on their excess return in the prior year and include dummies for quintiles two through five (quintile one is captured by the intercept). For the sake of brevity, we only report models in which excess returns are measured as one-factor alphas. The results are similar when we use objective-adjusted returns instead, albeit that the sensitivity of flows to performance is somewhat weaker for this metric at low levels of performance. In addition, the explanatory power of models using alphas is slightly higher, suggesting that investor pay more attention to risk-adjusted performance than objective-adjusted performance (see also Berk and van Binsbergen (2016) for this approach). This evidence also suggests that in assessing the returns of PF funds, the one-factor alpha results merit greater emphasis.

To remove the influence of outliers, inflows are winsorized at the 1st and 99th percentiles. Since data on assets are available at the fund level, and not the fund/class level, we estimate this model using the oldest available fund class for each fund.The findings are reported in Table 13. Column (i) contains the basic regression specification. There is no evidence that inflows are higher in PF funds, while the coefficients on the control variables are generally in line with prior evidence. In particular, there is a strong non-linear relation between prior performance and subsequent inflows. Funds in the second performance quintile receive 5 percentage point higher inflows than funds in the first quintile. Inflows are 10.9 and 12.8 percentage points higher for funds in the third and fourth quintiles, but the largest boost to inflows at 22.6 percentage points comes from being in the fifth performance quintile. In column (ii) we study whether the flow-performance relation differs between PF and non-PF funds. The results are interesting. The PF indicator itself, which captures PF funds in the lowest performance quintile, is negative. Thus, the worst performing PF funds actually experience more than nine percentage points *lower* inflows than similar non-PF funds. One possibility is that investors have higher performance expectations from PF funds, and such funds get punished more severely when their returns are particularly poor. The interactions between the performance quintile dummies and the PF dummy are all significantly positive and they essentially offset the negative coefficient on the PF dummy itself. This indicates that for quintiles two through five, inflows into PF and non-PF funds are very similar. These results are inconsistent with the view that PF fund structures allow for higher fees because investors in such funds are less sensitive to returns when it comes to the allocation and withdrawal of their capital. In models (iii) and (iv), we focus on the funds sold by families that offer both PF and non-PF funds. The findings are generally similar, but there is some indication in model (iii) that PF funds in general have 4 percentage points lower inflows than non-PF funds.

We have also studied whether the inflows of PF funds depend on their features. PF funds with only HWMs and no hurdle or stochastic benchmarks and funds with none of the features have significantly lower inflows than non-PF funds, holding performance constant. Inflows into the other PF funds are not different from inflows into non-PF funds after controlling for performance. Overall, this evidence does not support the view that PF funds attract dumb money relative to non-PF funds. On the contrary, investors are able to recognize at least some of the problem funds and redirect their flows accordingly.

3.6. Changes in contractual terms

In this section, we focus on PF funds only and examine whether they adjust their contractual features when prior performance has been poor, such that it becomes easier to earn performance fees in the future. Such behavior would be difficult to justify if the aim of the features is to align the interests of investors and fund managers in the first place.

First, we study whether PF funds with a stochastic benchmark are more likely to remove this benchmark when they have performed poorly in the previous year. Ninety out of 9,257 PF fund/classes remove their stochastic benchmark over our sample period. We estimate a linear probability model where the dependent variable is equal to one if the fund/class removes the stochastic benchmark in year *t*.[24] The explanatory variables are either (a) a dummy variable set equal to one if the firm's return in year *t-1* is below the PF benchmark, or (b) the PF-benchmark adjusted return in year *t-1*. Both models include investment objective and year dummies. Panel A of Table 14 contains the results. Model (i) illustrates that funds with performance below their benchmark are 0.84 percentage points more likely to remove the stochastic benchmark. This almost doubles the unconditional probability of 0.97%. Model (ii) shows a negative relation between prior year returns relative to the benchmark and the likelihood of removing the benchmark altogether; reducing benchmark-adjusted performance by one standard deviation (10.77%) increases the likelihood of dropping the benchmark by 0.59 percentage points, which is large economically relative to the unconditional mean.

Second, we study funds that have a hurdle and ask whether they reduce the magnitude of the hurdle after poor performance. Overall, 22.4% of fund/classes with a hurdle in a given year reduce their hurdle in the following year. As before, we address this question using a linear probability model. The dependent variable in this model is one if the fund/class reduces its hurdle in year *t* and zero otherwise, and the explanatory variables are excess returns in year *t-1*, as well as investment objective and year dummies. The results are displayed in Panel B of Table 14. In column (i) we employ the objective-adjusted return as a performance metric, and in column (ii) we use the one-factor alpha. Both models indicate that firms are more likely to reduce their hurdle rate when their performance in the prior year was poor. In terms of economic significance, decreasing objective-adjusted performance by one standard deviation (10.85% for funds with a hurdle), increases the likelihood of cutting the hurdle the following year by 1.73 percentage points, which is a 7.7% reduction relative to the sample average.

Funds that change or remove benchmarks to make it easier to earn subsequent performance fees appear to exhibit a strong disregard for their investors' interests. To assess whether this behavior predicts poor future performance, we augment our base case regression models reported in Panel A of Table 4 with three indicator variables: (i) *After Stochastic Benchmark Removal*, which is an indicator variable set equal to one for observations on funds after they remove their stochastic benchmark; (ii) *After Reducing Hurdle*, which is an indicator variable set equal to one for observations on funds after they reduce or remove the hurdle rate; and (iii) *After Easing of HWW*, which is an indicator variable set equal to one for observations on funds after they remove their HWM or reduce its duration. In models tabulated in the Internet Appendix, we show that, depending on the performance metric being used, firms removing the stochastic benchmark underperform other PF funds by 0.75% to 2% per year, funds that reduce the hurdle underperform other PF funds by roughly 1% per year, and funds that ease HWMs underperform other PF funds by 0.44% to 0.77% per year.[25] Thus, in deciding whether to remain invested in a PF fund, investors should pay particular attention when the contractual terms are changed in the fund's favor.

The results in this section suggest that some PF funds change the contractual terms of the PF contract in response to poor performance in such a way that it becomes easier to earn performance fees in the future. While such behavior does not occur often, there are a substantial number of PF funds that make at least some adjustment to ease the performance requirement before PF fees can be earned. Such behavior is a good predictor of poor subsequent performance.

4. Conclusion

In light of the recent regulatory interest in performance fees and the adoption of PF structures by a number of prominent fund management complexes, we examine various aspects of returns, risk taking, and expenses for all equity mutual funds offered for sale in the European Union, Norway, and Switzerland over the period 2001-2011, and compare PF and non-PF funds. We find no evidence that PF funds have superior performance compared to non-PF funds. On the contrary, PF funds perform worse than non-PF funds by 50-60 basis points per year, with much of the underperformance due to funds that do not set a stochastic benchmark against which performance is measured or that set a benchmark that is easy to beat. As a result, such funds earn their performance fees even when their performance is substandard and they have expense ratios significantly above those of other PF funds and of non-PF funds. We continue to find substantial underperformance when we study the same manager running PF and non-PF funds at the same time, indicating that return differences are not due to unobservable managerial quality.

[24] We present linear probability models for ease of interpretation, but our findings are very similar if we estimate probit models instead.

[25] We have also studied whether funds that keep their performance criteria constant over time (same stochastic benchmark, hurdle, and HWMs) perform better than funds that make changes to these criteria. This stability in performance criteria is not related to returns.

The positive conclusion is that the funds with problematic fee structures make up only 20% of all PF funds. Funds in the other categories that make up the bulk of the PF market do not significantly underperform. Thus, even in a market where fees are less regulated, investors can generally be relied upon to make the right investment choices.

We also document that some funds change the terms of the PF contract in response to poor performance such that it becomes easier to earn performance fees in the future. There is no evidence in our data, however, that PF contracts are associated with higher volatility, but some evidence that PF funds increase risk in the middle of an assessment period when the payoffs of the PF contract are more sensitive to risk changes. PF funds also take on more active risk.

From an investor's perspective, our results suggest that it is crucial to study the details of the PF contract to make sure that funds set benchmarks that are appropriate given the fund's underlying investment objective. Only setting a hurdle rate without adding a stochastic benchmark does not appear beneficial for fund investors. We also document that PF funds charge management fees at the same level as non-PF funds. Thus, on average, performance fees are paid in addition to management fees, not as a partial substitute, suggesting that PF structures sometimes serve as a mechanism for extracting excess fees. Again, this is an element of the PF contract that investors should pay particular attention to. When we study gross returns by adding back expenses, the underperformance of PF funds declines substantially.

Since certain PF funds underperform other funds with similar investment objectives, and since we find no evidence of excess performance for other PF funds, we conclude that the PF mechanism alone is not sufficient to induce better performance and to attract the best talent.

Contact information: Servaes (hservaes@london.edu), Sigurdsson (Sigurdsson.kari@gmail.com). We would like to thank Jonathan Berk, Dan Brocklebank, Marco Hanig, Antti Ilmanen, Peter MacKay, Andrew Mason, Toby Moskowitz, Christopher Palazzolo, Lukasz Pomorski, Dominic Rossi, Scott Richardson, João Santos (editor), an anonymous referee, and seminar participants at City University (London), ESCP Paris, The European Fund and Asset Management Association (EFAMA), Hong Kong University of Science and Technology, Inquire Europe, King's College, London Business School, Nanyang Technological University, National University of Singapore, Singapore Management University, the Stockholm School of Economics, the University of Edinburgh, the University of Hong Kong, the University of Surrey, and the University of Swansea for helpful comments and discussions, and Hugues Gillibert, Derek Godfrey, Thomas Ho, and Ed Moisson for help with the data. Bo Bian, Raja Patnaik, and Harshini Shanker provided excellent research assistance. We are grateful to Inquire Europe for financial support. Declarations of interest: Servaes: none; Sigurdsson: is employed by Schroders Asset Management, a global asset management firm. Schroders offers mutual funds without performance fees and mutual funds with performance fees. The views and opinions contained herein are those of the authors and not of Schroders. No responsibility or liability is accepted by Schroders, its officers, employees or agents for errors of fact or opinion or for any loss arising from use of all or any part of the information in this document.Eq. 1-4

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jfi.2022.100959.

Appendix. Explaining the use of performance fee contracts

In this Appendix, we study the relation between the likelihood that a fund has a PF structure and fund, fund management complex, and managerial characteristics. This investigation closely follows the work of Ma et al. (2019) who explore the relation between fund manager incentive contracts and the presence of both operational risk and agency conflicts between managers and fund shareholders. We have gathered information on many of the factors they propose. Unfortunately, while our data set is very rich in terms of information on the specifics of the PF contracts, we do not have information on all of their data items. This is partly the case because not all of this information needs to be disclosed in Europe or because of other organizational features of the European fund industry. For example, there are no disclosure requirements with regards to portfolio manager investments in the funds they manage.

Nevertheless, we are able to gather or compute a large number of the variables employed by Ma et al. (2019). These are the variables and the related predictions: (a) We hand match the fund management complexes in our sample to lists of banks, insurance companies, and broker dealers. Fund management complexes owned by these sets of companies would be inclined to focus on the performance of the entire organization rather than the fund, thereby necessitating the use of incentive contracts. (b) We employ the minimum required investment to proxy for investor sophistication and associated monitoring. Funds with a lower minimum investment are predicted to be more in need of incentive contracts to substitute for weaker investor monitoring. While our sample consists entirely of retail funds with minimum investment levels below €50,000, this still leaves us with sufficient cross-sectional variation to test this prediction. (c) We employ manager experience to proxy for reduced career concerns, necessitating the need for stronger incentives. This measure can only be computed for funds that disclose the name(s) of the manager(s). Experience is computed as the number of years since the manager's name first appeared in our dataset. For funds with multiple managers, we compute average experience (the results are the same if we use the experience of the longest-serving manager instead). (d) Team-managed funds may be more subject to free-rider problems necessitating the need for incentive contracts. (e) The effect of the total number of funds managed by the fund manager(s) on the adoption of performance fees could be positive, because busier managers need stronger incentives, or negative, because incentive-based pay creates conflicts between various funds, particularly if only some funds use performance fees. We count the total number of funds managed by all of a given fund's managers combined (using the average yields similar insights). (f) The flow-performance relation computed at the fund level could function as an alternative disciplining device, reducing the needs for stronger incentives. We compute this relation by estimating, for each fund, rolling regressions of monthly flows (computed as performance-adjusted growth in assets) on lagged one-factor alphas using twelve observations. This variable is winsorized at the 1st and 99th percentiles. As in Ma et al. (2019), we include a number of control variables: family size, family growth (computed as gross percentage growth in family assets), fund size, and fund age. We also include Morningstar category, year, and fund domicile dummies.

We then estimate linear probability models explaining whether funds have a PF structure or not. The models use one observation per year for each fund/class, measured in December, and standard errors are clustered at the fund level. The explanatory variables are measured at the same point in time as the PF indicator. Because there is little time series variation in the adoption of a PF structure by particular funds, and because the explanatory variables are slow moving, the results using lagged explanatory variables are virtually identical to models in which the explanatory variables are measured contemporaneously.

We report the results in the Internet Appendix. We find that team managed funds, younger funds, funds with lower initial investments, and funds managed by more experienced managers are more likely to have a PF structure. These results are consistent with the findings of Ma et al. (2019), and indicate that their findings also hold in a different setting.

We also find a negative relation between the number of other funds managed by all of the managers running a given fund and the use of PF contracts. However, this result is economically unimportant: doubling the number of funds run by managers decreases the likelihood of having a PF structure by 0.04 percentage points.

The one area where our findings differ from Ma et al. (2019) is that funds managed by companies owned by banks, insurance companies, or brokerage houses are seven percentage points less likely to have a PF structure, while Ma et al. (2019) find that managers of such funds are more likely to have performance pay in their contracts. While we do not have sufficient data to investigate the reason for this difference in more detail, we conjecture that there are two possible explanations. First, throughout our sample period PF contracts have been controversial and lawmakers have on various occasions called for a ban on such structures (without actually going through with it). It is therefore possible that banks, brokers, and insurance companies do not want to get involved in such structures. Second, while we are studying the contract between the fund and the fund investor, Ma et al. (2019) study the contract between the fund management company and the fund manager. It is therefore possible that banks, brokers, and insurance companies, which generally have more experience with incentive contracts for their employees, are also more prone to adopting incentive fee contracts for their fund managers. Given that such information does not need to be disclosed in Europe, we are unable to examine this conjecture.

Overall, many of our findings are broadly consistent with Ma et al. (2019), which attests to the generalizability of their findings

References

Agarwal, V., Daniel, N.D., Naik, N.Y., 2009. Role of managerial incentives and discretion in hedge fund performance. Journal of Finance 64, 2221–2256.

Aragon, G.O., Nanda, V., 2012. Tournament Behavior in hedge funds: High-water marks, fund liquidation, and managerial stake. Review of Financial Studies 25, 937–974.

Basak, S., Pavlova, A., Shapiro, A., 2007. Optimal asset allocation and risk shifting in money management. Review of Financial Studies 20, 1583–1621.

Berk, J.B., Green, R.C., 2004. Mutual fund flows and performance in rational markets. Journal of Political Economy 112, 1269–1295.

Berk, J.B., van Binsbergen, J.H., 2016. Assessing asset pricing models using revealed preference. Journal of Financial Economics 119, 1–23.

Brown, K.C., Harlow, W.V., Starks, L.T., 1996. Of tournaments and temptations: An analysis of managerial incentives in the mutual fund industry. Journal of Finance 51, 85–110.

Busse, J.A., 2001. Another look at mutual fund tournaments. Journal of Financial and Quantitative Analysis 36, 53–73.

Carhart, M.M., 1997. On persistence in mutual fund performance. Journal of Finance 52, 57–82.

Carpenter, J.N., 2000. Does option compensation increase managerial risk appetite? Journal of Finance 55, 2311–2331.

Chen, J., Hong, H., Huang, M., Kubik, J., 2004. Does fund size erode fund performance? Liquidity, organizational diseconomies, and active money management. American Economic Review 94, 1276–1302.

Chevalier, J., Ellison, G., 1997. Risk taking by mutual funds as response to incentives. Journal of Political Economy 105, 1167–1200.

Chevalier, J., Ellison, G., 1999. Career concerns of mutual fund managers. Quarterly Journal of Economics 114, 389–432.

Deuskar, P., Pollet, J.M., Wang, Z.J., Zheng, L., 2011. The good or the bad? Which mutual fund managers join hedge funds? Review of Financial Studies 24, 3008–3024.

Díaz-Mendoza, A.C., López-Espinosa, G., Martinez, M.A., 2014. The efficiency of performance-based fee funds. European Financial Management 20, 825–855.

Ding, B., Wermers, R., 2012. Mutual fund performance and governance structure: The role of portfolio managers and boards of directors. Working paper SUNY Albany and University of Maryland.

Drago, D., Lazzari, V., Navone, M., 2010. Mutual fund incentives fees: Determinants and effects. Financial Management 39, 365–392.

Elton, J.E., Gruber, M.J., Blake, C.R., 2003. Incentive fees and mutual funds. Journal of Finance 58, 779–804.

Fama, E.F., French, K.R., 2010. Luck versus skill in the cross-section of mutual fund returns. Journal of Finance 65, 1915–1947.

Ferreira, M.A, Keswani, A., Miguel, A.F., Ramos, S.B., 2012. The flow-performance relationship around the world. Journal of Banking and Finance 36, 1759–1780.

Ferreira, M.A, Keswani, A., Miguel, A.F., Ramos, S.B., 2013. The determinants of mutual fund performance: A cross-country study. Review of Finance 17, 483–525.

Frazzini, A., Lamont, O.A., 2008. Dumb money: Mutual fund flows and the cross-section of stock returns. Journal of Financial Economics 88, 299–322.

FSA, 2003, The CIS sourcebook – A New Approach, CP185.

Gaspar, J, Massa, M., Matos, P., 2006. Favoritism in mutual fund families? Evidence on strategic cross-fund subsidization. Journal of Finance 61, 73–104.

Goetzmann, W.N., Ingersoll, J.E., Ross, S.A., 2003. High-water marks and hedge fund management contracts. Journal of Finance 63, 1685–1717.

Golec, J., Starks, L., 2004. Performance fee contract change and mutual fund risk. Journal of Financial Economics 73, 93–118.

Grinblatt, M., Titman, S., 1989. Adverse risk incentives and the design of performance-based contracts. Management Science 35, 807–822.

Hamdani, A., Kandel, E., Mugerman, Y., Yafeh, Y., 2017. Incentives fees and competition in pension funds: Evidence from a regulatory experiment. Journal of Law, Finance, and Accounting 2, 49–86.

Ibert, M., Kaniel, R., Van Nieuwerburgh, S., Vestman, R., 2022. Are mutual fund managers paid for investment skill? Review of Financial Studies 31, 716–772.

Ippolito, R.A., 1992. Consumer reaction to measures of poor quality: Evidence from the mutual fund industry. Journal of Law and Economics 35, 45–70.

Jensen, M.C., 1968. The performance of mutual funds in the period 1945-1964. Journal of Finance 23, 389–416.

Khorana, A., 1996. Top management turnover: An empirical investigation of mutual fund managers. Journal of Financial Economics 40, 403–427.

Khorana, A., Servaes, H., Tufano, P., 2005. Explaining the size of the mutual fund industry around the world. Journal of Financial Economics 78, 145–185.

Khorana, A., Servaes, H., Tufano, P., 2009. Mutual fund fees around the world. Review of Financial Studies 22, 1279–1310.

Khorana, A., Servaes, H., Wedge, L., 2007. Portfolio manager ownership and fund performance. Journal of Financial Economics 85, 179–204.

Kritzman, M.P., 1987. Incentive fees: Some problems and some solutions. Financial Analysts Journal 43, 14–20. January/February.

Lee, J.H., Trzcinka, C., Venkatesan, S., 2019. Do portfolio manager contracts contract portfolio management? Journal of Finance 74, 2543–2577.

Ma, L., Tang, Y., Gómez, J., 2019. Portfolio manager compensation in the U.S. mutual fund industry. Journal of Finance 74, 587–638.

Massa, M., Patgiri, R., 2009. Incentives and mutual fund performance: Higher performance or just higher risk taking? Review of Financial Studies 22, 1777–1815.

Nanda, V., Wang, Z.J., Zheng, L., 2004. Family values and the star phenomenon. Review of Financial Studies 17, 667–698.

Panageas, S, Westerfield, M.M., 2009. High-water marks: High risk appetites? Convex compensation, long horizons, and portfolio choice. Journal of Finance 64, 1–36.

Pástor, Ľ., Stambaugh, R.F., Taylor, L.A., 2015. Scale and skill in active management. Journal of Financial Economics 116, 23–45.

Ptak, J., 2017, Performance fees: An idea whose time has come, Morningstar.

Reed, A., Wu, L., 2005. Racing the clock: Benchmarking or tournaments in mutual fund risk-shifting? Working paper. University of North Carolina.

Spiegel, M., Zhang, H., 2013. Mutual fund risk and market share-adjusted fund flows. Journal of Financial Economics 18, 506–528.

Sirri, E.R., Tufano, P., 1998. Costly search and mutual fund flows. Journal of Finance 53, 1589–1622.

Starks, L.T., 1987. Performance incentive fees: An agency theoretic approach. Journal of Financial and Quantitative Analysis 22, 17–32.