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Keywords: Managerial skills, mutual funds, short-sale constraint.
JEL Codes: G1, G2, J0

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Abstract

We investigate the impact of the absence of short selling on the pricing of managerial skills in the mutual fund industry. In the presence of divergent opinions regarding managerial skills, fund managers can strategically use fees to attract only the most optimistic capital. The recognition of this fee strategy helps explain a set of stylized observations and puzzles in the mutual fund industry, including the underperformance of active funds, the existence of flow convexity, and the negative correlation between gross-of-fee α and fees.

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Introduction

The asset pricing literature has shown that, in the presence of dispersion of opinion, short-sale constraints can prevent negative views from being incorporated into stock prices and may lead to overvaluation (e.g., Miller, 1977; Harrison and Kreps, 1978; Hong and Stein, 2003; Hong, Scheinkman and Xiong, 2006; Hong and Stein, 2007; Xiong and Yan, 2010). Compared to equity, short selling is more constrained for open-end mutual funds in the U.S. because neither direct nor synthetic short selling (i.e., derivatives) is available to mutual fund investors. This property, however, has attracted little attention in the mutual fund literature.[1] Such inattention is surprising, as one would expect, following the logic of the asset pricing literature, to observe even more substantial effects based on the more restrictive short-sale constraint of funds.

This paper aims to bridge the gap between the two literatures by focusing on the inability to short sell funds. Our key intuition is that the latter is also important to the mutual fund industry because it imposes a short-sale constraint on the pricing of *managerial skills*. Similarly to the stock market, the constraint may facilitate overpricing of managerial skills and contribute to the widely observed underperformance of active funds in the mutual fund industry (e.g., Malkiel, 1995; Gruber, 1996; Carhart, 1997; Wermers, 2000; Christoffersen and Musto, 2002). Our analysis, based on the unique organizational structure of the industry (e.g., "open-ending"), also helps reconcile several other salient, if not puzzling, features of the industry, including the negative correlation between fund performance and fees (e.g., Gil-Bazo and Ruiz-Verdú, 2009) and the convex relationship between flows of capital into funds and performance (e.g., Brown,

[1] The only exception is Gruber (1996), who observed in his Presidential Address that "because sophisticated investors can't short sell funds, they cannot eliminate inefficient funds." He further conjectured that "by disinvesting (or not investing) in these funds they eliminate the worst performing funds in the sample over time," which may limit the impact of the short-sale constraint in the long run. However, because the elimination of bad funds takes time, short-sale constraints may still have observable cross-sectional implications before bad funds are fully eliminated.

Harlow and Starks, 1996; Chevalier and Ellison, 1997). Our empirical analysis based on U.S. domestic equity funds over the sample period of 1991–2010 generates consistent results.

Intuitively, the constraint on short selling must be combined with differences in investor opinion regarding fund manager skills to induce overpricing. The mutual fund industry provides exactly such an economic ground: actively managed funds are likely to be subject to differing judgments because skills such as stock selection and market timing—being difficult to measure in a timely manner—naturally generate diverse opinions among investors. Given that the fees investors are willing to pay are largely determined by their perceptions of managerial value, dispersion of opinion among investors implies that those who are more optimistic about managerial skills are willing to pay higher fees to invest than their less optimistic peers.

Therefore, mutual funds can potentially charge fees that are higher than their actual performance to attract only the most optimistic investors (i.e., Winner's Curse). Of course, managers care not only about the levels of fees but also about the scale of fund capital under management, and the strategy of using fees to differentiate investor clienteles is not inconsequential to the latter. While attracting optimistic investors is beneficial given their willingness to pay higher fees, higher fees also constrain the clientele base of potential capitals a fund can attract. Hence, managers face a general tradeoff between charging higher fees to a few optimistic investors and charging lower fees to attract more investors/capital. Our general prediction is that it is optimal to charge high fees when investor dispersion of opinion is high. While more empirical evidence will be provided shortly, we observe that this prediction is consistent with the after-fee underperformance of active mutual funds, as active funds are subject to more diverse judgments. By contrast, funds not subject to investor disagreement would set fees equal to their managerial value (i.e., Berk and Green, 2004), attract more capital, and not underperform.

If we further explore the economic source of investor dispersion of opinion, a part of it may be related to, if not caused by, difficulties in assessing the values of the assets in which the fund invests and the overall dynamics of the market. Managers face the same difficulties but can overcome them, for instance, by collecting costly information (e.g., Admati and Pfleiderer, 1990). To the extent that higher information costs reduce the optimal level of alpha (Admati and Pfleiderer, 1990), we would expect funds with higher dispersion of opinion to deliver lower alpha. However, given that the very same dispersion of opinion makes it easier to charge higher fees relative to the alpha that a fund delivers, dispersion of opinion could cause performance and fees to be negatively related. This casts some light on the otherwise puzzling negative relationship between fund performance and fees.

The fact that mutual funds can use higher fees to attract more optimistic (about managerial skills) investors also affects flows. For funds that adopt high-fee strategies due to high dispersion of opinion, for instance, outperformance may lead to additional flows by attracting originally pessimistic investors (who usually do not invest in the fund) to start investing in the fund.[2] In contrast, funds that charge low fees due to low dispersion of opinion do not experience this effect because investors willing to invest in the fund are likely to have done so already. Hence, differences of opinion among investors allow funds to attract disproportionally larger inflows of capital following superior performance, creating a convex relationship between flows and performance.[3] While flows are known to be convex in performance (e.g., Brown, Harlow and

[2] Huang, Wei and Yan (2007), for instance, document that superior performance encourages participation. The difference is that participation in our framework is endogenized based on investors' opinions.

[3] An example may help here. Imagine that a "high fee/high dispersion of opinion" fund (Fund A) on average attracts only half of investors – i.e., the most optimistic ones – and compare it to a "low fee/low dispersion of opinion" Fund B that attracts all investors. Now assume that both Funds A and B outperform by the same amount, which suffices to convince all the investors of

Starks, 1996; Chevalier and Ellison, 1997), our new intuition is that heterogeneity of investor opinion may directly contribute to this property. The link between difference of opinion and flow convexity is a unique feature of the mutual fund industry, one that we argue is related to the inability to short mutual funds.

Overall, given that the short-sale constraint is always binding in the industry, we expect dispersion of opinion among investors to push up fund fees, facilitate a negative fee-alpha relationship, and enhance flow convexity in the open-end mutual fund industry. To apply these properties to real data, we notice that dispersion of opinion itself may vary across funds, which, combined with short-sale constraint, can create cross-fund variations in the above properties. Our empirical analyses, therefore, begin with two empirical measures to capture how investors may disagree about managerial value, building on two intuitions developed in the recent literature.

First, skilled managers can create value either by investing in good stocks in fund holdings (e.g., Cremers and Petajisto, 2009) or by adopting a dynamic trading strategy which can generate "return gaps" in addition to holding-implied returns (e.g., Kacperczyk, Sialm and Zheng, 2008). If so, both disagreements on the value of fund holdings—proxied by analyst dispersion—and difficulties in recognizing the value of fund dynamic trading strategy—proxied by the time-series variation in return gaps—contribute to investors' potential disagreement regarding managerial skill. This intuition allows us to build up the first measure on fund-level dispersion of opinion, *DispSum*, as the (normalized) summation of analyst dispersion and the return gap dispersion of a fund.

Second, investors may also disagree about the attractiveness of a fund due to the difference in their consumption-based marginal utilities. Following Ferson and Lin (2014), we use state-level

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Fund A's managerial value. Fund A will see a surge of inflows, as the remaining half of investors – the originally less optimistic ones – start to invest. Fund B will not see a surge of inflows because investors willing to invest in Fund B have already done so. In this case, flows into Fund A are more "convex" than those into Fund B.

electricity consumption growth rates as the proxy for marginal utility of investors within a state, and construct the second measure of investors' dispersion of opinion regarding the skill of a fund, *OHET*, as the cross-state dispersion (standard deviation) of the correlation between a fund's risk-adjusted return and state-level electricity consumption growth.

To some extent, the first measure captures the intuition that information asymmetry may somehow contribute to disagreement—i.e., investors disagree about fund performance when they have incomplete information about managerial activities, whereas the second measure assumes that investors agree upon fund performance—but that a same piece of fund performance contributes differently due to their consumption heterogeneity. The two proxies, therefore, capture different (and complementary) economic sources of investor disagreement in the mutual fund industry.

We find that both measures of dispersion of opinion are positively related to mutual fund fees, as conjectured. A one-standard-deviation higher dispersion measured by *DispSum*, for instance, allows funds to charge 4.9 bps (basis points) more in total annual fees. When fund fees are further adjusted by their style average, the corresponding effects are of similar economic and statistical significance. To appreciate the magnitude of the fee increase, we can compare it to the average annual expense ratio of funds in our sample: 1.26%. In this case, 4.9 bps represents around 4% increase in fees. Given that the mutual fund industry manages trillions of dollars in assets, the total additional fees that optimistic investors pay are substantial.

Next, in line with the literature, we find that the relationship between fees and (gross-of-fee) performance is significantly negative in our sample. As predicted by our working hypothesis, such a negative relationship disappears when we control for dispersion of opinion, suggesting that we are on the right track in understanding the true relationship between fees and performance.

Finally, if we directly relate a proxy of the convexity of the flow-performance relationship to dispersion of opinion (both estimated over the life-time of the fund), we find a positive correlation between the two. A one-standard-deviation increase in *DispSum*, for instance, is related to a 0.0094 increase in flow convexity, which amounts to 14.5% of the average flow convexity in the sample (the average flow convexity estimated for the entire sample period is 0.065). These findings confirm that dispersion of opinion directly affects the convexity of the relationship between fund flows and past performance.

Our main contribution is to apply intuitions about the effects of short-sale constraints to the pricing of managerial value in the asset management industry. It is well known that active funds deliver net-of-fee performance below that of market indexes (e.g., Malkiel, 1995; Gruber, 1996; Carhart, 1997; Wermers, 2000; Christoffersen and Musto, 2002; Gil-Bazo and Ruiz-Verdú, 2009). By showing that fund managers can charge higher fees when there is dispersion of opinion regarding managerial skills, we provide a new intuition for understanding the mutual fund industry.

In doing so, we build on and extend Berk and Green's (2004) "equilibrium" view that the competitive supply of capital allows managers to use fees to obtain the economic rent that they create (i.e., alpha) in the mutual fund industry,[4] as well as the literature rationalizing the industrial and organizational structure of active or index funds (e.g., Chen, Hong, Huang and Kubik, 2004; Hortaçsu and Syverson, 2004; Stein, 2005; Garcia and Vanden, 2009; Glode, 2011; Pastor and Stambaugh, 2012) and the literature on mutual fund fees (e.g., Chordia, 1996; Nanda, Narayanan and Warther, 2000; Christoffersen and Musto, 2002; Das and Sundaram, 2002). Our

[4] Berk and Tonks (2008) describe more empirical patterns of fund flows predicted by the model.

analyses support the general intuition of the literature that imperfect fund competition could allow fund managers to obtain economic rents. Our unique contribution is to explore the conditions under which managers may obtain even more economic rents than they create.

In suggesting that the negative correlation between fees and performance may be due to dispersion of opinion, we also directly contribute to the literature documenting the puzzling negative relationship between fees and fund performance (e.g., Gruber, 1996; Carhart, 1997; Christoffersen and Musto, 2002; Gil-Bazo and Ruiz-Verdú, 2009). The literature also documents that funds with identical characteristics may set different fees, which violates the law of one price (e.g., Cooper, Halling and Lemmon, 2012). Fee strategies proposed by our analyses may provide an alternative economic explanation. Grinblatt, Ikaheimo, Keloharju and Knüpfer (2013) observe that high-IQ investors are less likely than low-IQ investors to invest in high-fee funds. To the extent that low-IQ investors may face higher information costs, leading to greater disagreement among them, we indeed expect funds with low-IQ investors to set higher fees.

Finally, our findings provide new insight into the convex flow-performance relationship. The literature typically treats fund size and flows as exogenous (Christoffersen and Musto, 2002) and argues that exogenous flow convexity creates incentives for funds to embrace risk-taking strategies when they lag their competitors (e.g., Brown, Harlow and Starks, 1996; Chevalier and Ellison, 1997; Sirri and Tufano, 1998; Kempf and Ruenzi, 2008). We endogenize fees and flows and argue that causality could be the other way around. That is, managers first establish fees according to dispersion of opinion among potential investors; then, based on the timing of flows—i.e., reduced flows in normal days (which is consistent with Ferson and Lin, 2014) and disproportionally high flows in days with extraordinary performance—flow convexity emerges as a consequence of dispersion of opinion. Consistent with Spiegel and Zhang (2013), flow convexity is related to the degree of heterogeneity among investors.

The remainder of the paper is organized as follows. In Section II, we provide a stylized model that rationalizes our intuition and provides some testable predictions. In Section III, we describe the data and the construction of the main variables. In Section IV, we relate dispersion of opinion regarding managerial skills to funds' fee policies. In Section V, we relate dispersion of opinion to the relationship between performance and fees. In Section VI, we investigate the relationship between dispersion of opinion and the convexity of the fund flow-performance relationship. A brief conclusion follows.

II. A Stylized Model and Its Predictions

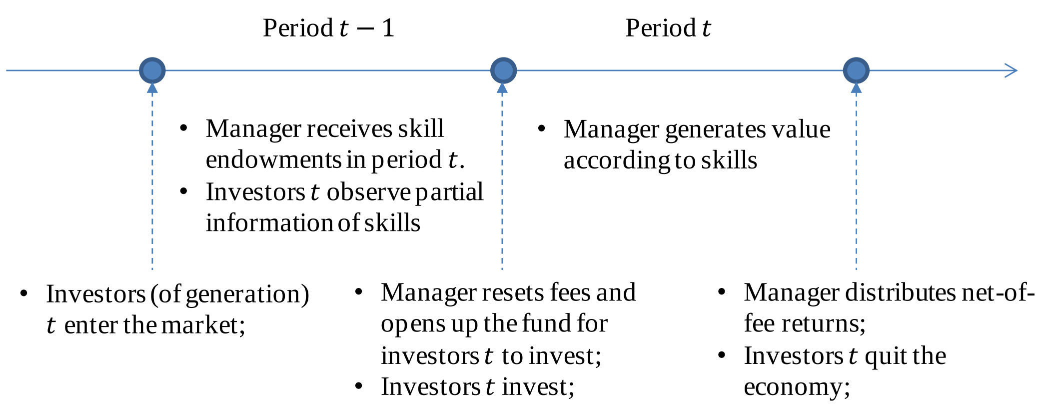
We start from Admati and Pfleiderer's (1990) intuition that some agents in the economy (hereafter, fund managers) can collect costly information and establish investment vehicles for those who cannot afford to pay the information cost (hereafter, fund investors). This intuition is formulated using an overlapping generation model. By paying a private cost in period *t-1*, managers are endowed with portfolio-management "skills", θ_t, that can be used to generate risk-adjusted returns in period *t*. The *distribution* of skills, which will be specified shortly, is known to the public. At the beginning of period *t*, managers determine fund fees (denoted as f_t per dollar invested) and invite investors of generation *t* to invest for one period.

Investors of generation *t* enter the market in period *t-1*, at which time they partially observe θ_t. At the beginning of period *t*, after fees are announced, they invest in mutual funds based on their knowledge of θ_t.[5] Investment managers then manage the capital of investors according to

[5] This time convention captures the real world situation that investors can only observe fund fees and have a vague and partial view of how good a fund manager might be when they invest. Note that fund fees will be determined based on *ex-ante* rather than

their skills (θ_t) and deliver returns on investment net of fees by the end of the period. Generation t investors then quit the economy, replaced by the next generation, which enters the economy in period t and invests in period $t+1$. Managerial skills are reshuffled according to a Markov chain in period $t+1$, and fees are reset accordingly. The economy thus repeats itself. The general timeline for generation t investors is illustrated in Figure 1.

Figure 1: The Timeline of the Model



Much of the intuition behind this model can be derived by examining one generation of investors. Hence, when there is no confusion, we suppress the subscript t for brevity; we will add back the time index when the discussion involves more than one time period. Following Berk and Green (2004), we assume that managerial skills allow managers to generate risk-adjusted returns, or α, with a quadratic cost. We also follow the mutual fund literature and assume that managerial skills are multifaceted; i.e., there are various types of portfolio management skills, including (but not limited to) stock selection and market timing. Hence, without loss of generality, we model two different types of managerial skills, labeling them "selection" and "timing". The costs and benefits of the two skills are formulated as follows:

ex-post abilities. This assumption is reasonable because no one, including fund managers themselves, knows exactly the *ex-post* value of their abilities in the future.

ASSUMPTION 1 *(managerial skills): By paying a private cost C in period t-1, managers are endowed with stock-selection ability, s, and market-timing ability, m, which can generate abnormal (relative to the market index) performance $\phi(s)$ and $\phi(m)$ in period t per dollar invested, respectively. The two managerial skills are independent of each other. Both $\phi(s)$ and $\phi(m)$ take the value of α or 0 with a 50% probability. This ex-ante distribution is known to the public. The overall cost for the asset manager is $C = \frac{1}{2}c\alpha^2$, where c is a parameter that measures cost.*

These assumptions define four possible scenarios of managerial values: $\{\phi(s) = 0, \phi(m) = 0\}$, if the manager has neither selectivity nor market-timing skills; $\{\phi(s) = 0, \phi(m) = \alpha\}$, if the manager has only market-timing but no selectivity skills; $\{\phi(s) = \alpha, \phi(m) = 0\}$, if the manager has only selectivity but no market-timing skills; and $\{\phi(s) = \alpha, \phi(m) = \alpha\}$, if the manager has both selectivity and market-timing skills. *Ex-ante* (i.e., before period *t*), each scenario has a 25% probability. At the beginning of period *t*, the managers know which scenario has been realized. Overall, the net-of-fee value created by the fund becomes $\phi(s) + \phi(m) - f$ per dollar invested in each scenario.

Investors face higher learning costs than fund managers and have difficulty assessing the true value of managers. This may be due to the gradual nature of information flow, limited attention, and heterogeneous priors (e.g., Hong and Stein, 2007), as well as financial illiteracy and search costs (e.g., Choi, Laibson and Madrian, 2010; Grinblatt, Ikaheimo, Keloharju and Knüpfer, 2013). Importantly, when investors assess only partial information, they may disagree on the overall value of managerial skills if their sources of partial information do not match perfectly.[6] To model this property, we follow Hong and Stein (2003) in assuming that different investors are

[6] Such difficulty and disagreement exists not only among investors but also among econometricians, who are presumably equipped with better information and analytical tools.

endowed with different partial and private signals of managerial skills and that investors use public information whenever they have insufficient private information.

***ASSUMPTION 2A** (dispersion of opinion regarding managerial skills): There are two types of investors in each generation. Before they invest, Type I investors directly observe s but not m, while Type II investors directly observe m but not s. When an investor does not directly observe a particular type of managerial ability, she relies on the unconditional expected value of that ability, where the latter is common to the whole market. The different types of investors cannot effectively communicate with each other or learn from each other and thereby obtain complete information.*

To quantify the economic impact of dispersion of opinion, we examine a benchmark case in which there is no disagreement among the investors about fund skills.[7] This scenario is based on the following assumption:

***ASSUMPTION 2B** (the benchmark case of no dispersion of opinion): Each type of investor observes both m and s before he/she invests.*

Dispersion of opinion regarding managers is related to the cost of information. For example, when assets and market trends are "more difficult" to evaluate or trade upon, investors will be less likely to pass judgment on fund managers. However, this is the same kind of situation in which fund managers will face higher information acquisition costs, implying that higher information costs for managers spur greater disagreement among investors. This intuition is captured by the following assumption:

***ASSUMPTION 3** (information costs and investor disagreement): Investor dispersion of opinion increases in the information costs of fund managers.*[8]

[7] An alternative interpretation of the "no disagreement" assumption is that it may also arise when an introduction of short selling allows investors of the types described in (2A) to effectively communicate with each other. Both interpretations lead to similar cross-sectional implications: more disagreement leads to more potential overpricing when investors cannot short funds.

Each type of investor has initial capital q. At the beginning of period *t*, investors who believe the fund to be a good investment invest. Investors who believe the fund to be a bad investment, however, cannot short it. To simplify the investor decision, following Berk and Green (2004), we assume that investors' capital is competitively supplied in the market.

ASSUMPTION 4 *(competitive capital supply): The supply of capital from the two types of investors, X_1 and X_2, is positive, provided the return on investment exceeds the return that investors could obtain through alternative investment channels (which generate zero alpha).*

From the above assumptions, when investors have diverse opinions, the supply of capital from Type I investors is $X_1 = qI\{\phi(s) + E[\phi(m)] - f > 0\}$, where $E[\phi(m)]$ is the market expectation of the abnormal returns that can be generated by the market-timing ability of the manager and $I\{\}$ is the indicator function. Similarly, $X_2 = qI\{E[\phi(s)] + \phi(m) - f > 0\}$, where $E[\phi(s)\,]$ is the market expectation of the abnormal returns that can be generated by the stock-selection ability of the manager.

All the above assumptions describe what happens to one generation of investors when they observe partial information. Based on these assumptions, we can examine the economy when learning over time is prohibited. In this case, the decisions of each generation of investors are identical. Hence, we can focus on one (representative) generation to obtain our main predictions. The Internet Appendix demonstrates that, under very reasonable assumptions (summarized by Assumption 5 in the Internet Appendix), our main predictions are robust even when we allow for learning over multiple periods.

[8] The main results remain if we more precisely specify the learning costs of managers and investors, linking learning costs of investors to the probability that investors observe both types of managerial skill (the probability is introduced in Assumption 5 in the Internet Appendix). We use Assumption 3 to simplify the math and thereby highlight the intuition.

To solve the economy for a representative generation, we posit that managers maximize private-cost-adjusted gross income by choosing the fees they charge and the performance they generate in any given period (the subscript *t* is suppressed):

$$Max_{f,\alpha}\, Gross\ Income - Private\ Cost = f \times (X_1 + X_2) - \frac{1}{2} c \times \alpha^2. \qquad (1)$$

Fund managers can forecast the volume of expected flows that can be attracted based on their fee strategy in each scenario, and use these forecasts to choose the optimal level of fees and alphas to maximize the expected gross revenue across all scenarios. The key intuition is that, to earn higher income, funds can use two different strategies: attract more capital—i.e., increase $X_1 + X_2$ – or set higher fees. The following proposition indicates that, in the presence of investor dispersion of opinion, the (optimal) fee can be set higher than the level of performance that the manager can produce. This leads to our main proposition:

PROPOSITION 1 *(the pricing of managerial skills): Dispersion of opinion among fund investors allows funds to charge fees higher than the performance they deliver. Without such dispersion, the optimal fee is as high as the performance the funds deliver.*

Here we briefly describe the intuition behind the proof, which is presented in Appendix I. Consider the scenario in which a manager is endowed only with selection ability; i.e., $\{\phi(s) = \alpha, \phi(m) = 0\}$. Type I investors directly observe the fund manager's strong skill in *s* but not his poor skill in *m*. These investors are willing to pay a fee as high as the actual (observed) value of *s* plus the expected value of *m*, i.e., 1.5α. Hence, provided the manager charges a fee below or equal to 1.5α, these investors will invest. In contrast, Type II investors directly observe the manager's poor skill in *m* but not his strong skill in *s*. Therefore, these investors are only willing to pay a fee as high as the expected value of *s* plus the actual (observed) value of *m*, i.e., 0.5α.

Hence, Type II investors invest if the fund fee is below 0.5α and stay away from the fund if the fund fee is above that value.

If the fund manager wants to attract both types of investor, the optimal fee will be 0.5α. An alternative choice for the manager is to set a fee as high as 1.5α, in order to attract only the first type of investor. Given that each type of investor has the same amount of capital to invest, the optimal choice will be to charge a high fee and attract only half of the investors in the market; this strategy yields a gross income of 1.5α; the other strategy yields α. In this scenario, because Type I investors do not directly observe the negative information regarding the fund manager's lack of market-timing skills, they overpay for it.[9]

In contrast, if both types of investor directly observe both skills, they will be willing to pay a fee as high as α, in line with Berk and Green's (2004) argument that managers obtain the economic rent that they generate, i.e., α. In our model, the fee strategy goes beyond that: dispersion of opinion creates an "overpricing" pattern in the economic rent that they generate. While we only examine one fund in the model, if there is in fact a cross section of funds that operate in the manner described in our model, then "high dispersion of opinion/high fee funds"—i.e., active funds—may differ from "low dispersion of opinion/low fee funds"—e.g., index funds—in that they charge higher fees and manage smaller pools of capital, a pattern that is consistent with evidence suggesting that active funds underperform the market (e.g., Malkiel, 1995; Gruber, 1996; Carhart, 1997; Wermers, 2000; Christoffersen and Musto, 2002; Gil-Bazo and Ruiz-Verdú, 2009). Similarly, fees may also differ among active funds or among index funds, depending on the relative scope of dispersion of opinion. For instance, some index funds may

[9] Note that the optimal fee of 1.5 is determined by maximizing expected revenues across all four scenarios. That is, the fee is not determined by the realization of managerial abilities but rather by their *ex-ante* distribution. Hence, investors cannot use fees to learn what scenario they are in.

also relatively over-charge based on the multifaceted services that they provide, if investors can only partially assess information about these services.

The literature reports not only the existence of high-fee funds but also a striking negative relationship between fees and α (e.g., Gil-Bazo and Ruiz-Verdú, 2009). This negative relationship arises naturally in our model. To see the intuition, consider a variation in the learning cost of fund managers, e.g., related to the need to invest in less easy-to-price South East Asian stocks. A higher cost would reduce the optimal level of α that managers want to deliver. However, a higher cost would also imply greater difficulty for investors in assessing the skills of fund managers and therefore increase investor dispersion of opinion. This, in turn, allows fund managers to charge higher fees (relative to α). Hence, an increase in information costs can lead to a simultaneous decrease in α and an increase in fees. This intuition is summarized in the following corollary:

Corollary 1 *(negative relationship between fees and alpha): If increased information costs increase the fee/alpha ratio (by increasing disagreement among investors) more than it reduces alpha, fees and alpha are negatively related.*

This corollary suggests that the negative correlation between alpha and fees may be generated by omitted variables such as information costs. If we could empirically control for information costs, this would eliminate the puzzling negative correlation between alpha and fees. Of course, we cannot directly observe the private information costs of fund managers. However, because the necessary condition (and the economic channel) for the correlation is that private information costs correlate with dispersion of opinion, controlling for the latter should also absorb the negative correlation, which is the empirical strategy adopted later in this paper.

The next question is whether dispersion of opinion affects funds' flow sensitivities. Our intuition is that by attracting only the most optimistic flows in the market, funds catering to investors with diverse opinions have more additional flows to gain in very good periods because strong performance may persuade previously less optimistic investors to invest. The following proposition addresses this notion:

PROPOSITION 2 *(flow convexity): Dispersion of opinion regarding managerial skills disproportionally increases inflows following outperformance, raising flow convexity with respect to managerial skills.*

An example will illustrate the intuition behind the proposition. If we rank the four scenarios previously defined from worst to best in terms of managerial value, the sequence of the scenarios can be stated as $\{\phi(s) = 0, \phi(m) = 0\}$, $\{\phi(s) = 0, \phi(m) = \alpha\}$, $\{\phi(s) = \alpha, \phi(m) = 0\}$ and $\{\phi(s) = \alpha, \phi(m) = \alpha\}$. It can be shown that capital flows in these four scenarios are {0,1,1,2} for funds about which there are diverse opinions and {0,2,2,2} for funds about which opinion is uniform.

Let us focus on the three scenarios in which funds can be successfully launched (i.e., we remove the first scenario in which investors do not invest at all). An improvement in fund performance from average to superior means that the fund moves from the two scenarios in the middle to the last (and best) scenario. When there is dispersion of opinion, inflows jump from 1 to 2 because in the last scenario, even the less optimistic investors now start to invest. In contrast, when there is no dispersion of opinion, inflows remain at 2 because all the money that could have been attracted to the fund has already been invested. The flow sequence of 1, 1, and 2 of the first fund exhibits convexity compared to the sequence of 2, 2, and 2 of the second fund. Thus, because the flow gain in the last scenario for the first fund is more sensitive to fund performance than that of the second fund, whose flow gain is effectively insensitive to performance, funds subject to high dispersion of opinion have greater flow convexity than funds not subject to dispersion of opinion.

Later sections of the paper will take up the task of testing the implications of Propositions 1 and 2 and Corollary 1. More specifically, Proposition 1 implies that dispersion of opinion among investors allows funds to charge high fees. Corollary 1 implies that, first, dispersion of opinion is related to lower performance because the former implies higher information cost—this feature can be regarded as an "interim" property of the model which can be verified by data. More importantly, Corollary 1 suggests that the negative correlation between fees and performance could be partially explained by dispersion of opinion. Proposition 2 predicts that flow-performance convexity increases in dispersion of opinion. More specifically, flow convexity is achieved in the following way: a high dispersion of opinion discounts flows during normal periods and allows funds to attract disproportionally high flows when funds achieve very good performance.

III. Data and Variable Description

A. Proxies for Dispersion of Opinion Regarding Managerial Skills

To test our intuitions with data, we require proxies for the degree to which investors disagree among themselves regarding the skills of fund managers. We first follow the spirit of Kacperczyk, Sialm and Zheng (2008) and decompose managerial value into an observable part, based on fund holdings, and an unobservable part, namely, the "return gap" generated by the "unobserved actions" of the fund. The observable part, following Cremers and Petajisto (2009), can be further decomposed into a passive (benchmark) component and an active component. The active part of holdings reflects observed managerial skills, which synchronizes both stock selection and market timing.[10] However, investors may not agree on the value of the active part. In that case, investors will also disagree on the value of managerial skills. Because dispersion of opinion among analysts provides a solid reference point for possible differences in evaluation in the market, we can use dispersion of analyst opinion regarding active holdings to proxy for disagreements about managerial value related to this observable part.

Regarding the unobserved component of managerial value, our knowledge of the explicit strategies adopted by skilled fund managers—whether their skills lie in interim stock selection or market timing—is by definition limited. However, as Proposition 3 in the Internet Appendix reveals, less persistent return gaps, by increasing the difficulty for effective learning, increase disagreement. This allows us to use the degree of persistence of return gaps to empirically proxy for the unobserved component of managerial skills.

More particularly, we can decompose the value (alpha) of managerial skills into benchmark-adjusted return and unobserved actions as follows:

$$\alpha_{f,m} = \left(r_{holding,f,m} - r_{BMK,m}\right) + r_{unobserved,f,m}, \tag{2}$$

where $\alpha_{f,m}$ is the managerial value of fund f in month m, $r_{holding,f,m}$ and $r_{unobserved,f,m}$ refer to the holding-based return and gross-of-fee return gap, respectively, and $r_{BMK,m}$ refers to the observed benchmark index return. Consistently, dispersion of opinion regarding managerial skills also arises from the two sources as follows (suppressing the fund index f):

$$\sigma_{\alpha}^{2} = \sigma_{active}^{2} + \sigma_{unobserved}^{2}, \tag{3}$$

where σ_{α}^{2}, σ_{active}^{2} and $\sigma_{unobserved}^{2}$ refer to the dispersion of opinion regarding managerial value, active holdings, and the return gap, respectively.

[10] For instance, Jiang, Yao and Yu (2007) argue that return-based market-timing measures are subject to an "artificial timing" bias and that fund holdings provide the proper information to estimate market timing.

This decomposition allows us to link the dispersion of opinion about fund skills to two components, each providing a specific economic source to proxy for investor disagreement. The first source can be proxied by the dispersion of analyst opinion as follows: $DispAnalyst_{f,t} = \sum_{i\in f} \omega_{i,f,t}\sigma_{i,t}$, where $\omega_{i,f,t}$ is the investment weight of stock i in fund f in quarter t, and $\sigma_{i,t}$ is the standard deviation of analysts' earnings forecasts, scaled by the absolute value of the average forecast in each quarter.[11] If the values of fund benchmarks are not subject to disagreement, we should use benchmark-adjusted investment weights (empirically, we use the style average to proxy for benchmark requests) to compute analyst dispersion. However, if investors also disagree about the value of the benchmark, then we should use un-adjusted weights to compute analyst dispersion; in this case, investors will disagree even more about the additional value created by fund managers.[12] Because we cannot rule out the possibility of disagreement regarding benchmark values, we use both the unadjusted measure and the adjusted measure in our later tests (they lead to very similar results).

The second source is proxied by the square root of the squared average monthly return gap in that quarter: $DispGap_{f,t} = \sqrt{\sum_{m\in t} Gap_{f,m}^2 /3}$, where $Gap_{f,m}$ refers to the return gap of fund f in month m of quarter t. The return gap itself is computed as the difference between the fund's gross-of-fee return and holding-based return. This proxy captures the learning impact which we discuss in details in the Internet Appendix: a more volatile realization of unobserved fund skills implies a less persistent transition of managerial skills over periods, which reduces the

[11] All the results we display also hold in the case when we standardize the dispersion of analyst opinion on the basis of the price of the stock in the previous quarter.

[12] That is, $\sigma_{active}^2 = \sigma_{r_{holding,f,m} - r_{BMK,m}}^2 = \sigma_{r_{holding,f,m}}^2 + \sigma_{r_{BMK,m}}^2$, if active shares are orthogonal to benchmark holdings. If the value of a benchmark is not subject to disagreement, analyst dispersion measures based on adjusted and unadjusted investment weights will have exactly the same power.

effectiveness of learning and increases the dispersion of opinion. Using other proxies, e.g., the standard deviation, for the second moment of the return gap does not change our main results.[13]

We then construct an overall measure of dispersion of opinion on managerial skills as:

$$DispSum_{f,t} = \sqrt{\left(DispAnalyst_{f,t}/DispAnalyst_t\right)^2 + \left(DispGap_{f,t}/DispGap_t\right)^2}, \qquad (4)$$

where $DispAnalyst_{f,t}$ and $DispGap_{f,t}$ are defined as above, $DispAnalyst_t$ and $DispGap_t$ refer to the market average of analyst dispersion and return gap dispersion in the same quarter. That is, the overall measure sums up the two proxies for dispersion of opinion related to observed and unobserved portfolio strategies. Of course, since analyst dispersion and return gap uncertainty have different economic scales, we normalize the two components by their sample mean in each period. It is important to stress that our results are robust to the way we normalize the two components and, as will be seen in the Internet Appendix, each component contributes significantly to our main findings.

Our second proxy for dispersion of opinion is the orthogonalized investor heterogeneity measure documented by Ferson and Lin (2014). More specifically, investor heterogeneity is constructed as follow:

$$HET_f = Std\left[\left(-\rho_{\varepsilon m}/\rho_{mr_{j^*}}\right)\sigma\left(\varepsilon_f\right)SR_{max}\right], \qquad (5)$$

where $\rho_{\varepsilon m}$ refers to the time-series correlation between a fund's Fama-French three-factor adjusted residual return and a state's electricity consumption growth, $\rho_{mr_{j^*}}$ refers to the correlation between state-level electricity consumption growth and the maximum correlation portfolio of the benchmark returns, $\sigma\left(\varepsilon_f\right)$ refers to the residual volatility of fund f, SR_{max} refers to the maximum Sharpe ratio, and $Std[.]$ denotes the cross-sectional standard deviation across

[13] Of course, second-order moments may also reflect the risk of investments from investors' perspective. However, the property of high risk should discourage risk-averse investors from investing in funds and works only against the willingness of investors to pay higher fees. Hence, our empirical findings are irrelevant to this "high risk" interpretation.

the 50 states and the District of Columbia. Next, for each period we run a cross-sectional regression of HET_f on heteroskedasticity-consistent standard error estimates for funds' three-factor alphas, and take the intercept plus residuals of these regressions as the orthogonalized investor heterogeneity measure OHET_f.

We rely on these two measures to capture different economic sources of investor dispersion of opinion. The first measure captures the intuition that investors disagree about fund performance when they lack proper information. This disagreement, therefore, is fundamentally driven by investors' incomplete information in general and the information asymmetry between fund manager and investors in particular. The second measure assumes that investors already agree upon the measurement of fund performance. However, they disagree on the value of fund performance with respect to their own consumption path. Both types of disagreements may exist in practice and the two economic grounds complement each other in providing a more complete description on investor dispersion of opinion. Hence, it will be interesting to explore how these two measures affect the equilibrium properties of the mutual fund industry in terms of fees, performance, and flows.

Before moving to the data, we wish to stress two points. First, as of now, all proxies are constructed at quarterly frequency. However, our results are robust to different sample frequencies.[14] Second, one might be tempted to use realized flows to derive proxies for dispersion of opinion among fund investors, e.g., some proxy for dispersion based on the standard deviation of fund flows. Proxies based on realized flows, however, are problematic for our empirical tests because flows are a consequence of the fee strategies of funds rather than

[14] There are both pros and cons to using quarterly frequency. On the one hand, quarterly frequency allows us to capture time-series variations in investor dispersion of opinion. Moreover, fees and fund holdings are usually sampled at a quarterly frequency. On the other hand, information within a quarter might be noisy and unstable. Of course, potential noise makes finding significant relationships more difficult.

their cause. More specifically, fund flows reflect the dispersion of opinion of *existing* investors rather than *potential* investors. It is the latter that is needed to test the impact of dispersion of opinion on fees. For instance, if a fund has used high fees to filter out pessimistic investors, its existing investors on average should have homogeneous (and optimistic) views regarding the fund manager's skills. This makes measures based on flows unsuitable for our tests.

B. Data Sources and Sample Description

We obtain quarterly institutional equity holdings from Thomson-Reuters's mutual fund holdings database. The data contain quarter-end security holding information for all registered mutual funds that report their holdings to the U.S. Securities and Exchange Commission (SEC). We match the holdings database to the Center for Research in Security Prices (CRSP) mutual fund database, which reports monthly total returns and total net assets (TNA). We focus on U.S. equity mutual funds and include all CRSP/CDA-merged general equity funds that have one of the following Lipper objectives: 'EI', 'EMN', 'G', 'GI', 'I', 'LSE', 'MC', 'MR', or 'SG'. We use both active and passive funds for fee and flow-convexity related tests because our model allows funds to choose to be active or passive. We consolidate multiple share classes into portfolios by adding together share-class TNA and by value-weighting share-class characteristics (e.g., returns or fees) based on lagged share-class TNA.

In our tests of fund performance, we follow Gil-Bazo and Ruiz-Verdú (2009) and exclude index and institutional funds to ensure that managerial skills are non-zero *ex-ante* and that the results are not driven by differences between institutional and retail funds. Robustness checks (unreported) show that including index and institutional funds does not change our main conclusions with respect to α. Our final sample includes 2,454 equity mutual funds.

Daily and monthly stock data come from the CRSP database, quarterly analyst data come from the Institutional Brokers' Estimate System (I/B/E/S) database, and annual state-level electricity consumption data come from the U.S. Energy Information Administration (EIA) website. Our main testing period is 1991–2010, a period for which we have monthly TNA and flow data. However, our main conclusions regarding fund fees, flow convexity, and the fee-alpha relationship are robust to various testing periods, as shown below.

Fees are defined as annualized expense ratios reported by funds in each quarter. For each fund, we also construct a list of control variables, including the bid-ask spread, the logarithm of the market value of stocks, the number of analysts, the logarithm of fund TNA, the logarithm of fund age, and turnover of the fund. The portfolio-level control variables involving stock characteristics (e.g., bid-ask spread, the logarithm of the market value of stocks, and the number of analysts) are computed as the investment value-weighted average of stock characteristics. Detailed definitions of other variables are provided in Appendix II.

Summary statistics are presented in Table 1. Panel A reports the mean, median, standard deviation, and quantile distribution of the dispersion proxies (estimated at quarterly frequency as well as based on the entire sample period), mutual fund fees, monthly fund returns, monthly fund flow, flow convexity, and other quarterly stock and fund characteristics. Panel B reports correlations among the main variables.

In Table 1, we can observe that mutual fund fees, defined as the percentage expense ratio, have very wide distributions. For instance, while the average expense ratio in our sample is 1.26% per year, its standard deviation is 0.47%, suggesting significant variations in fees in the sample. This result directly motivates our paper, which seeks to illuminate the economic grounds for these variations.

Meanwhile, the correlation matrix suggests that the empirical relationships among the main variables are largely consistent with our model. First, the two measures of dispersion are in line with our first two propositions, positively correlated with fund fees and flow convexity. Furthermore, dispersion measures as well as fund fees are negatively correlated with the gross-of-fee alpha of funds. These two patterns are consistent with Assumption 3 and Corollary 1. Of course, the correlations do not indicate whether the negative correlations between fees and alpha are related to dispersion of opinion. The supportive evidence regarding the first two propositions may also arise due to a lack of proper controls. The remainder of the paper, therefore, utilizes multivariate regression analysis to formally examine the effects of dispersion of opinion.

IV. Dispersion of Opinion and Fund Fees

We report the impact of dispersion of opinion on mutual fund fees in Table 2. Panel A uses the overall measure of dispersion of opinion on managerial skills $DispSum_{f,t}$ as the main independent variable, while in Panel B, the dispersion of opinion is proxied by the orthogonalized investor heterogeneity $OHET_{f,t}$. Independent variables and control variables are lagged by one quarter. We focus on quarterly Fama-MacBeth regressions and report Newey-West-adjusted t-statistics with three lags, and get very similar results from panel regressions with time and fund fixed effects and standard errors clustered at the fund level.

In each panel, Models 1 to 4 use unadjusted fees as the dependent variable, while in Models 5 to 8, all variables are adjusted by netting out their style average. The latter adjustment allows us to compare the impact of dispersion of opinion on fees among similar funds, which avoids potential bias arising from the fact that different fund styles are associated with different fees.

The difference between the first two models is that Model 2 includes the bid-ask spread (hereafter *Spread*) of stocks held by the funds. The bid-ask spread controls for stock-level market inefficiency related to, for example, information asymmetry and liquidity. In Models 3 and 4, we include log(stock size) × log(fund TNA) and log(stock size) × fund turnover. These interactions control for the effects of (dis)economies of scale and trading costs on fund fees. The intuition is that the higher costs involved in trading small stocks, particularly when coupled with larger fund TNA and high fund turnover, may affect fund fees. However, we observe that neither *Spread* nor the two interaction terms affect the sensitivity of fund fees to dispersion of opinion, suggesting that fee sensitivity with respect to dispersion of opinion is, in fact, independent of market liquidity, (dis)economies of scale, and trading costs.

These findings show that dispersion of opinion is positively related to higher fees, a result that holds across the different specifications and is economically significant. In Model 2 of Panel A (Panel B), a one-standard-deviation higher dispersion measured by *DispSum* (*OHET*) is related to 4.9 (0.8) bps higher annual fees.[15] Tests based on style-adjusted fees show a similar economic and statistical impact, confirming that the relationship between fees and dispersion of opinion is robust among comparable funds. The effect especially of the first measure is sizable, given the trillions of dollars in assets under management. The economic impact of the second measure is smaller. However, this smaller magnitude only suggests that fee strategies may have different levels of sensitivities to different grounds of dispersion of opinion—dispersion of opinion induced by incomplete information may have more direct impact on fees than consumption-based heterogeneity. The prediction that mutual funds can charge higher fees is fully supported by both measures.

We provide additional robustness checks in later sections when we test the relationship between fees and alpha (Tables 4 and 5). It will be confirmed that the relationship between fees

[15] For instance, the economic impact for *DispSum* is quantified as 0.052% × 0.934 = 0.049%, where 0.052% is the regression parameter of *DispSum* on annualized fees and 0.934 is the standard deviation of *DispSum*.

and dispersion of opinion remains positive and significant when we control for fund performance, use OLS regression models with clustered standard errors, or use alternative proxies for market incompleteness. Furthermore, an analysis based on different subsamples (e.g., among load or no-load funds) and sub-periods or with annual sampling frequency does not change the results.

The Internet Appendix also provides more analyses. Recall that *DispSum* is computed from the normalized summation of analyst dispersion (*DispAnalyst*) and return gap uncertainty (*DispGap*)—and the normalization process, while reflecting the overall impact of the two components, may distort the economic magnitude. Table A1 in our Internet Appendix confirm that mutual fund fees are positively associated with each of the two components, and that the joint impact of the two components can amount to about 14.4 bps. To further explore the economic impact of dispersion of opinion on fees, we have constructed two additional proxies in the Internet Appendix based on performance dispersion in the time series and the number of share classes offered by a same fund (Ferson and Lin, 2014). In Table A5, a one-standard-deviation increase in dispersion of opinion proxied by these two proxies is related to 13.7 and 16.1 bps of higher annual fees, respectively. In short, the positive relationship between fees and dispersion of opinion is very robust.

V. Dispersion of Opinion and the Fee-Performance Relationship

We now move on to performance. We proceed in two steps: we first look at the relationship between dispersion of opinion and performance and then we relate the latter to fees, properly controlling for dispersion of opinion.

To conduct these tests, we follow the literature (e.g., Carhart, 1997; Gil-Bazo and Ruiz-Verdú, 2009) and estimate gross-of-fee α in a given month as the difference between the before-expense return of the fund and its realized risk premium, defined as the vector of beta—

estimated from a five-year rolling Fama-French-Carhart four-factor model for the five years preceding the month in question—times the vector of realized factors for that month. This rolling alpha captures the gross-of-fee performance that funds can deliver out of sample. We then compute quarterly alphas of funds as the average of monthly alpha values of funds within a given quarter.

Table 3 tabulates the relationship between gross-of-fee performance and dispersion of opinion. We have argued that higher private information cost of funds leads to lower optimal alpha. This, coupled with the assumption that information cost enhances disagreement, would imply a negative relationship between (before-fee) performance and dispersion of opinion of funds. This interim prediction is confirmed by Table 3. In Model 2 (Model 6), for instance, a one-standard-deviation increase in *DispSum* (*OHET*) is related to 82 bps (22 bps) lower gross-of-fee four-factor adjusted performance per year. Again, we see that the economic impact of the second measure on alpha is smaller than that of the first. However, the negative relationship is highly significant across all empirical specifications. (Unreported) tests using style-adjusted alphas and dispersion proxies lead to very similar results. For brevity the table is not tabulated here.

Next, we examine how, by properly controlling for dispersion of opinion, we can eliminate the puzzling negative correlation between alpha and fees, as reported in Gil-Bazo and Ruiz-Verdú (2009). Empirically, we expand the previous fee regressions to include performance of funds (alpha) as well as the interaction between alpha and dispersion of opinion.

The results are reported in Table 4, Panel A for *DispSum* and Panel B for *OHET*. Again, we report four regression models in which we use raw fees and four models in which fees are style-adjusted. Several findings are worth noting. First, we observe a strong negative relationship between fees and performance. This observation confirms the striking results of Gil-Bazo and Ruiz-Verdú (2009) that fees are negatively associated with gross-of-fee α. Second, and more importantly, we find that this negative relationship becomes insignificant once we properly control for the impact of dispersion of opinion (i.e., Models 4 and 8). Finally, consistent with the observation of Table 3 that the first proxy of *DispSum* has a larger impact on alpha, here we also observe that the same proxy better explains the negative alpha-fee relationship, as an outright control for *DispSum* suffices to absorb the economic significance of the negative alpha-fee relationship in Models 2 and 6. These observations suggest that dispersion of opinion due to the lack of information could affect managerial incentive the most.

As a further robustness check, we follow Gil-Bazo and Ruiz-Verdú (2009) in replicating the alpha-fee relationship tests, using different sample periods (1991−2010 and 2001−2010), different estimation methodologies (pooled OLS and Fama-MacBeth estimations), different sub-samples of funds (i.e., no-load funds and load funds, and excluding small funds), style-adjusted fees, and alternative market inefficiency proxies (Griffin, Kelly and Nardari, 2010), where the latter include |*VR-1*|, the absolute value of the variance ratio (VR) minus one (where VR in a given quarter is computed as the ratio of the variance of five-day holding-based fund returns to five times the variance of daily holding-based fund returns), and *Delay*, the difference between unrestricted and restricted adjusted R-square statistics from market models containing contemporaneous and lagged returns.

We report the robustness checks in Table 5. Panel A reports the regression parameters and their clustered (by time, following Gil-Bazo and Ruiz-Verdú, 2009) standard errors or Newey-West adjusted t-statistics for the sample period from 1991 to 2010. Panel B reports similar statistics, with all variables adjusted by netting out their style average. In Panel C, no-load funds are defined as those charging no front- or back-end loads. Fees for load funds are defined as the annual expense ratio plus the front-end loads divided by the assumed holding period in years. Panel D reports the regression parameters and their Newey-West adjusted t-statistics for the later period from 2001 to 2010. All the pooled specifications include quarter dummies.

The independent variable of interest is the gross-of-fee alpha. The first three columns specify the sample, regression condition, and alternative proxies of market inefficiency of the tests. The next column reports the regression parameter between fees and alpha when market inefficiency and other control variables are included. In the interest of brevity, we tabulate only the coefficient for alpha. The next three columns tabulate the regression parameters for alpha, *DispSum*, and the interaction between *DispSum* and alpha. We adopt specifications similar to those of Model 4 of Table 4. Finally, the last three columns tabulate the regression parameters for alpha, *OHET*, and the interaction between *OHET* and alpha.

The results show that the positive relationship between dispersion of opinion and fees is robust to different models and specifications. More importantly, dispersion of opinion absorbs the negative fee-α correlation, as in the previous specification, confirming that the negative correlation could indeed arise from missing variables such as dispersion of opinion.

VI. Dispersion of Opinion and Flow Convexity

We now focus on the relationship between dispersion of opinion and flow convexity. Recall that our model not only depicts a general positive relationship between flow convexity and dispersion of opinion, but also predicts a specific channel through which such relationship can be achieved: that is, funds with dispersion of opinion should receive discounted flows on average and disproportionally high flows when fund performance is superior. Accordingly, our goal is twofold in this section: we first verify the patterns of the specific channel, and then move on to quantify the long-term relationship between dispersion of opinion and flow convexity.

To achieve the first goal, we introduce dispersion of opinion into the conventional flow-performance analyses based on quarterly Fama-MacBeth specifications. More specifically, we regress the fund flow on the rank of past performance, dispersion of opinion as well as the interactions between performance rank and dispersion of opinion. Fund rank (Low/Med/High) is based on a function of lagged returns, defined following Sirri and Tufano (1998). At the beginning of each quarter, we rank the mutual funds according to their lagged returns and normalize the ranks to follow a [0, 1] uniform distribution. Low is defined as $Rank$ if $Rank \leq 0.3$, Med is defined as $Rank - 0.3$ if $0.3 < Rank \leq 0.7$, $High$ is defined as $Rank - 0.7$ if $0.7 < Rank \leq 1$.

The results are reported in Table 6. As predicted by the model, dispersion of opinion is in general related to discounted fund flows—but its interaction with a high return rank significantly promotes fund flow. The two effects jointly exacerbate the convex flow-performance sensitivity. Indeed, if we focus on the interaction term between dispersion of opinion and fund flows in Model 2 (Model 6), a one-standard-deviation increase in *DispSum* (*OHET*) is related to 2.6% (0.9%) lower flows per year and 3.5% (0.8%) higher flows per year for funds with highly ranked performance. The economic magnitude does not vary much across different models, suggesting that the impact of dispersion of opinion on flows is robust. Again, style-adjustments lead to similar conclusions. To save space they are not tabulated here.

It is worth noting that the above quantification is likely to underestimate the overall impact of dispersion of opinion according to our model, because both discounted flows on average and disproportionally high flows following superior performance contribute to the formation of flow convexity—yet the interaction term in the conventional flow-performance regression framework captures only the latter effect. To better quantify the overall impact of dispersion of opinion on flow convexity, we can focus on the long-term relationship between dispersion of opinion and flow convexity, and define flow convexity for each fund f over the entire sample period as $FlowConvexity_f = Corr(Flow_{f,m}, Rank^2_{f,m-1})$, where $Flow_{f,m}$ refers to the monthly flow of fund f in month m, and $Rank_{f,m-1}$ is the rank of fund performance proxied by the style-adjusted fund return. The ranks are normalized to follow a [0, 1] uniform distribution for each month. We then estimate, in cross-sectional regressions, the relationship between the average convexity of funds and average dispersion of opinion, which are also estimated over the entire lives of funds. This test captures the long-term impact of dispersion of opinion on flow convexity.

Table 7 presents the regression parameters and their robust t-statistics, Panel A for *DispSum* and Panel B for *OHET*. The results display a positive correlation between dispersion of opinion and fund flow convexity, a correlation that holds across different specifications and is economically significant. In Panel A (Panel B) Model 2, a one-standard-deviation increase in the long-term average of *DispSum* (*OHET*) is related to a 0.0094 (0.011) increase in flow convexity,[16] which amounts to 14.5% (16.9%) of the average flow convexity observed in the sample (the average flow convexity in the full sample being 0.065). Interestingly, the economic impact of the second measure of *OHET* in this test is marginally larger than that of the first measure. This pattern differs drastically from what we have seen in the previous tests, suggesting that the second measure is more powerful in describing investor behavior than in affecting managerial incentives. In this regard, the two proxies indeed capture very different economic grounds of dispersion of opinion.

[16] I.e., $0.012 \times 0.784 = 0.0094$, where 0.012 is the regression parameter of *DispSum* on flow convexity and 0.784 is the standard deviation of *DispSum* in the full sample.

The Internet Appendix further confirms that the above results are robust to the two components of *DispSum*, analyst dispersion and return gap dispersion. Overall, the evidence supports the view that dispersion of opinion plays a fundamental role in the determination of fund fees, the fee-performance relationship and flow convexity.

Conclusion

We study the financial market implications of the inability of investors to short sell mutual funds. We argue that the inability to short sell mutual funds, coupled with dispersion of opinion regarding managerial skills, may foster overpricing in the market for managerial skills.

Funds catering to investors with diverse opinions will attract the most optimistic flows of capital in the economy, a fact that gives rise to convex flow-performance sensitivity. When both fund alpha and fund fees are determined by managers, dispersion of opinion tends to move alpha and fees in opposite directions, creating a puzzling negative relationship between fees and alpha.

Our analysis is consistent with various features of the mutual fund industry. Our new predictions that dispersion of opinion increases fund fees and flow convexity and that this helps explain the negative relationship between fees and alpha are fully supported by the data. Overall, short-sale constraints on managerial skills provide a novel economic foundation upon which to understand the role of mutual funds in financial markets as well as that of other types of corporations with similar institutional characteristics.

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Appendix I

Proof (Proposition 1): We begin by differentiating between the main decisions made by managers of funds with and without (investor) dispersion of opinion.

Managerial Problem 1 *(in the presence of dispersion of opinion): Conditional on assumptions 1, 2A, 3, and 4, managers solve the following maximization problem:*

$$Max_{f,\alpha} \quad f \times q\Big[I\big\{\phi(s)+E\big[\phi(m)\big]-f>0\big\}+I\big\{E[\phi(s)]+\phi(m)-f>0\big\}\Big]-C. \qquad \text{(A1)}$$

Managerial Problem 2 *(with no dispersion of opinion): In this case, managers solve:*

$$Max_{f,\alpha} \quad f \times q\Big[I\big\{\phi(s)+\phi(m)-f>0\big\}+I\big\{\phi(s)+\phi(m)-f>0\big\}\Big]-C. \qquad \text{(A2)}$$

The two managerial decisions (i.e., the optimal levels of fees, f^*, and alpha, α^*) can be solved separately by first computing f^*, conditional on α, and then solving for the optimal level of α.

Denote $\bar{\alpha} = \alpha/2$ as the expected value of each specific skill. Further define a dummy variable, d, which takes a value of 1 when investors have dispersion of opinion with respect to the fund manager's ability and 0 otherwise. While in this simple model, we use only a binary distribution for this dispersion of opinion variable, extension to a continuous distribution would not change the intuition underlying the analysis.[17] We summarize investors' demand for both funds in four different scenarios of endowments of managerial abilities as follows.

Scenario	Funds with Dispersion of Opinion ($d = 1$)		Funds with no Dispersion of Opinion ($d = 0$)	
	X_1 (observe s)	X_2 (observe m)	X_1 (observe s, m)	X_2 (observe s, m)
$\{\phi(s) = \alpha, \phi(m) = \alpha\}$	$I\{s + E[m] - f\}$ $=I\{\alpha + \bar{\alpha} - f\}$	$I\{E[s] + m - f\}$ $= I\{\alpha + \bar{\alpha} - f\}$	$I\{s + m - f\}$ $= I\{2\alpha - f\}$	$I\{s + m - f\}$ $=I\{2\alpha - f\}$
$\{\phi(s) = \alpha, \phi(m) = 0\}$	$I\{s + E[m] - f\}$ $=I\{\alpha + \bar{\alpha} - f\}$	$I\{E[s] - f\}$ $= I\{\bar{\alpha} - f\}$	$I\{\alpha - f\}$	$I\{\alpha - f\}$
$\{\phi(s) = 0, \phi(m) = \alpha\}$	$I\{E[m] - f\}$ $= I\{\bar{\alpha} - f\}$	$I\{E[s] + m - f\}$ $= I\{\alpha + \bar{\alpha} - f\}$	$I\{\alpha - f\}$	$I\{\alpha - f\}$
$\{\phi(s) = 0, \phi(m) = 0\}$	$I\{E[m] - f\}$ $= I\{\bar{\alpha} - f\}$	$I\{E[s] - f\}$ $= I\{\bar{\alpha} - f\}$	0	0

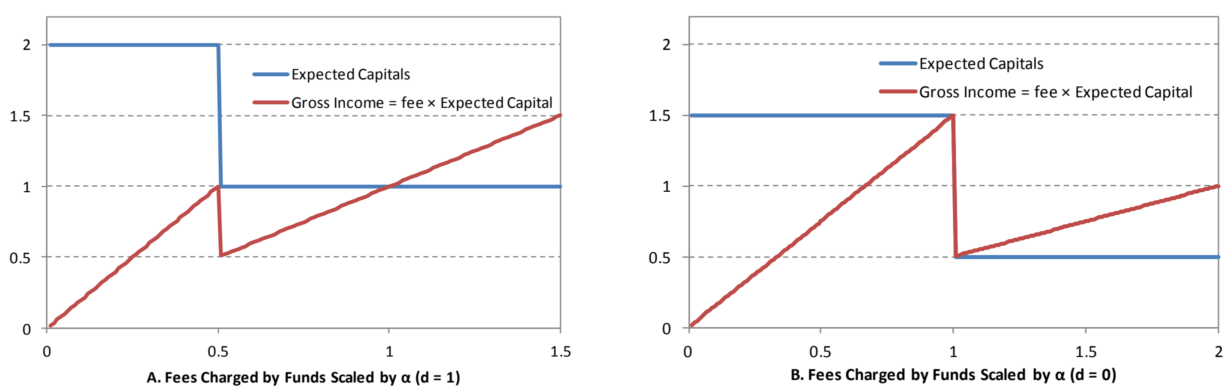
[17] For instance, we can write what investors observe as $\theta_i = d_i \times s + (1 - d_i) \times m$, where $i \in \{1,2\}$ denotes the type of investor. In this expression, dispersion of opinion is described by d_i, which can have a continuous value. However, the main intuition of the model remains the same.

Next, for funds subject to dispersion of opinion ($d = 1$), we tabulate the possible fee schemes and the corresponding incomes. Comparison across fee schemes helps us directly find the optimal fee scheme that would enable managers to maximize their income.

Fees Charged by a Fund ($d = 1$)	Expected Capital from Investors X_1 (observe s)	X_2 (observe m)	Total Capital ($\bar{X} = E[X_1 + X_2]$)	Gross Income ($f \times \bar{X}$)
$f > \alpha + \bar{\alpha}$	$E[X_1] = 0$	$E[X_2] = 0$	0	0
$f = \alpha + \bar{\alpha}$	$E[X_1] = 1/2$	$E[X_2] = 1/2$	1	$\alpha + \bar{\alpha}$
$\bar{\alpha} < f \leq \alpha + \bar{\alpha}$	$E[X_1] = 1/2$	$E[X_2] = 1/2$	1	f
$f \leq \bar{\alpha}$	$E[X_1] = 1$	$E[X_2] = 1$	2	$2f \leq 2\bar{\alpha}$
Because $\bar{\alpha} < \alpha$, the global optimal solution becomes: $f^* = \alpha + \bar{\alpha} = 1.5\alpha$, $\bar{X} = 1$, and $Gross\ Income = \alpha + \bar{\alpha} = 1.5\alpha$.				

From the table, the optimal fee that the $d = 1$ type of fund could charge is 1.5 times α. Panel A of Figure A1 illustrates the relationship between fee (scaled by α) and the corresponding gross income. It is clear in the figure that a fee of 1.5 times α maximizes the fund's income.

Figure A1: Fund Capital Flows and Gross Revenues as a Function of Fees



Similarly, we can replicate this analysis for the $d = 0$ type of fund (no dispersion of opinion). Fees and gross income values are summarized in the following table:

Fees Charged by Fund ($d = 0$)	Expected Capital from Investors X_1 (observe s, m)	X_2 (observe s, m)	Total Capital ($\bar{X} = E[X_1 + X_2]$)	Gross Income ($f \times \bar{X}$)
$f = 2\alpha$	$E[X_1] = 1/4$	$E[X_2] = 1/4$	$1/2$	α
$\alpha < f < 2\alpha$	$E[X_1] = 1/4$	$E[X_2] = 1/4$	$1/2$	$f/2$
$f \leq \alpha$	$E[X_1] = 3/4$	$E[X_2] = 3/4$	$3/2$	$3f/2$
The global optimal solution: $f^* = \alpha$, $\bar{X} = 3/2$, and $Gross\ Income = 1.5\alpha$.				

In this case, the optimal fee is exactly the value of α. However, because it attracts more capital (not only the most optimistic capital), the fund ends up earning gross income similar to that of the fund subject to dispersion of opinion. Panel B of Figure A1 illustrates the relationship between fee and the corresponding gross income of a fund not subject to dispersion of opinion. Q.E.D.■

Proof (Corollary 1): Following Proposition 1, managers of funds subject to dispersion of opinion solve $Max_{\alpha}\, Gross\, Income - C = 1.5\alpha - \frac{1}{2}c \times \alpha^2$. This maximization leads to the following first-order condition (FOC): $\alpha^* = 1.5/c$.[18] The general intuition behind the FOC is straightforward: when α is more costly, managers deliver a smaller α. This condition, however, is not inconsequential when combined with the third assumption that investor dispersion of opinion increases in the learning costs of the fund managers (mathematically, $\partial c/\partial d > 0$). Indeed, we can re-write Proposition 1 as $f^* = g(d) \times \alpha^*$, where $g(d)$ captures the impact on fees of dispersion of opinion. In general, $\frac{\partial g}{\partial d} > 0$.

It is easy to check that changes in fees follow $\frac{1}{f^*} \times \frac{\partial f^*}{\partial c} = \frac{1}{g} \times \frac{\partial g}{\partial c} + \frac{1}{\alpha^*} \times \frac{\partial \alpha^*}{\partial c} = \frac{1}{g} \times \frac{\partial g}{\partial d} \times \frac{\partial d}{\partial c} + \frac{1}{\alpha^*} \times \frac{\partial \alpha^*}{\partial c}$. The two components to sum up, $\frac{\partial g}{\partial d} \times \frac{\partial d}{\partial c} > 0$ and $\frac{\partial \alpha^*}{\partial c} < 0$, correspond to the two offsetting effects of the private cost of information on fees: i.e., a higher private cost can both increase fees by boosting dispersion of opinion among investors and reduce fees by reducing the optimal level of alpha that funds can deliver. When $\frac{1}{g} \times \frac{\partial g}{\partial d} \times \frac{\partial d}{\partial c} + \frac{1}{\alpha^*} \times \frac{\partial \alpha^*}{\partial c} > 0$, or when the cost of c increases the fee/alpha ratio more than it reduces alpha, any increase in c simultaneously increases fees and reduces alpha; i.e., it generates a negative correlation between fees and alpha. Q.E.D. ■

Proof (Proposition 2): Let us first compute the capital flows attracted (inflows) for each scenario in the following table and then compute their sensitivity to fund performance. In the

[18] This solution is identical for both funds with or without dispersion of opinion.

four scenarios of this exhibit, managerial skills (i.e., fund performance) are poorest in the first scenario, average in the two scenarios in the middle, and best in the final scenario. Flows of capital into funds subject to dispersion of opinion, from worst to best, are $\{0,1,1,2\}$, while flows of capital into funds not subject to dispersion of opinion are $\{0,2,2,2\}$.

Scenario	$d = 1$ Funds ($f^* = \alpha + \bar{\alpha}$)			$d = 0$ Funds ($f^* = \alpha$)		
	X_1	X_2	$X_1 + X_2$ (Fund Capital)	X_1	X_2	$X_1 + X_2$ (Fund Capital)
1. $\{\phi(s) = 0, \phi(m) = 0\}$	0	0	0	0	0	0
2. $\{\phi(s) = 0, \phi(m) = \alpha\}$	0	1	1	1	1	2
3. $\{\phi(s) = \alpha, \phi(m) = 0\}$	1	0	1	1	1	2
4. $\{\phi(s) = \alpha, \phi(m) = \alpha\}$	1	1	2	1	1	2

Because of the dollar flow discount due to dispersion of opinion, funds subject to dispersion of opinion attract lower flows when managerial skills are approximately average (scenarios 2 and 3 above). Second, when these funds outperform, they expect an increase in flows because previously less optimistic investors also start to invest. In contrast, funds not subject to dispersion of opinion seek to attract flows from both types of investor in most scenarios (but not the worst-case scenario). Hence, moving from scenario 3 to 4 will not further increase flows. This proves that flows are more sensitive to strong managerial performance for funds subject to diverse opinions than for funds not subject to diverse opinions.

Note that funds not characterized by dispersion of opinion do not generate flow convexity because, unlike Berk and Green’s (2004) model, our base model does not allow the flow of capital to increase to the point where αs are subsumed. Rather, managers maintain a positive alpha, which facilitates their fee strategy. Q.E.D. ■

Appendix II: Variable Definitions

Variables	Definitions
A. Dispersion Measures	
DispAnalyst	$DispAnalyst_{f,t} = \sum_{i \in f} \omega_{i,f,t} \sigma_{i,t}$, where $\omega_{i,f,t}$ refers to the investment weight of stock i in fund f in quarter t, $\sigma_{i,t}$ refers to the standard deviation of analysts' earnings forecast, scaled by the absolute value of average forecast in each quarter.
DispGap (in %)	$DispGap_{f,t} = \sqrt{\sum_{m \in t} Gap_{f,m}^2 / 3}$, where $Gap_{f,m}$ refers to the return gap of fund f in month m of a quarter t. Return gap is computed as the difference between fund gross-of-fee return and holding-based return.
DispSum	The normalized summation of analyst dispersion and return gap uncertainty. More specifically, $DispSum_{f,t} = \sqrt{\left(DispAnalyst_{f,t}/DispAnalyst_t\right)^2 + \left(DispGap_{f,t}/DispGap_t\right)^2}$, where $DispAnalyst_{f,t}$ and $DispGap_{f,t}$ are defined as above, $DispAnalyst_t$ and $DispGap_t$ refer to the cross-sectional average of analyst dispersion and return gap dispersion in quarter t, respectively.
OHET	OHET refers to the orthogonalized investor heterogeneity (HET). More specifically, $HET_f = Std\left[\left(-\rho_{\varepsilon m}/\rho_{mr_{j^*}}\right)\sigma(\varepsilon_f) SR_{max}\right]$, where $\rho_{\varepsilon m}$ refers to the time-series correlation between a fund's Fama-French three-factor adjusted residual return and a state's electricity consumption growth, $\rho_{mr_{j^*}}$ refers to the correlation between state-level electricity consumption growth and the maximum correlation portfolio of the benchmark returns, $\sigma(\varepsilon_f)$ refers to the residual volatility of fund f, SR_{max} refers to the maximum Sharpe ratio, and $Std[.]$ denotes the cross-sectional standard deviation across the 50 states and the District of Columbia. Next, for each period we run a cross-sectional regression of HET_f on heteroskedasticity-consistent standard error estimates for funds' three-factor alphas, and take the intercept plus residuals of these regressions as the orthogonalized measure OHET_f. See Ferson and Lin (2014) for more details.
DispAnalyst (Full Sample)	$\overline{DispAnalyst}_f = \sum_{t=1}^{T} DispAnalyst_{f,t} / T$, where $DispAnalyst_{f,t}$ refers to the quarterly analyst dispersion as defined before, and T indicates the total number of quarters that fund f operates over the entire sample period.
DispGap (Full Sample, in %)	$\overline{DispGap}_f = \sqrt{\sum_{m=1}^{M} Gap_{f,m}^2 / M}$, where $Gap_{f,m}$ refers to the monthly return gap of fund f as defined before, and M indicates the total number of months that fund f operates over the entire sample period.
DispSum (Full Sample)	The normalized summation of $\overline{DispAnalyst}$ and $\overline{DispGap}$, defined similar to *DispSum*.
B. Fund Fees	
Expense Ratio (in %)	The annualized expense ratio as reported in CRSP survivorship bias free mutual fund database.
Total Fee (2-year holding period)	The annualized expense ratio plus half of the front-end loads.
Total Fee (7-year holding period)	The annualized expense ratio plus one-seventh of the front-end loads.
C. Performance Measures (in %)	
Fund Total Return	The monthly return reported by CRSP survivorship bias free mutual fund database.
Four-factor adjusted Gross-of-	Gross-of-fee fund return minus the productions between a fund's four-factor betas multiplied by the realized four factor returns in a given month. The four Fama-French-Carhart factors include market, size, book-to-market, and momentum. Gross-of-fee fund return refers to the fund total return plus one-twelfth of the annualized expense ratio. The betas of the fund are estimated as the exposures of the fund to the relevant risk factors with a five-year estimation period.
Style-adjusted Return	Fund returns minus the average return of the funds in the same style.
D. Fund Flow and Flow Convexity	
Flow (in %)	Fund flow in a given month m is computed as follows: $Flow_{f,m} = \left[TNA_{f,m} - TNA_{f,m-1} \times \left(1 + r_{f,m}\right)\right]/TNA_{f,m-1}$, where $TNA_{f,m}$ refers to the total net asset of fund f in month m, and $r_{f,m}$ refers to fund total return in the same month.
Flow Convexity	Flow convexity is estimated for each fund over the entire sample period as follows: $FlowConvexity_f = Corr(Flow_{f,m}, {Rank_{f,m-1}}^2)$, where $Flow_{f,m}$ is defined as before, and $Rank_{f,m-1}$ refers to the rank of style-adjusted fund returns, and the ranks are normalized to follow a [0, 1] uniform distribution.
E. Stock Characteristics	
Log (Stock Size)	The logarithm of market value of stocks, in millions.
Num_AnalystRec	The number of analyst following this firm as reported in I/B/E/S.
F. Fund Characteristics	
Log (Fund TNA)	The logarithm of total net asset as reported in CRSP survivorship bias free mutual fund database, in millions.
Log (Fund Age)	The logarithm of number of operational months since inception.
Fund Turnover	The turnover ratio as reported in CRSP survivorship bias free mutual fund database.
G. Market Inefficiency Measures	
Spread	The bid-ask spread as reported in CRSP.
|VR-1|	|VR-1| refers to the absolute value of variance ratio (VR) minus one, where VR in a given quarter is computed as

	the ratio between variance of five-day holding-based fund returns and five times the variance of daily holding-based fund returns.
Delay	Delay refers to the difference between the unrestricted and the restricted adjusted R-square from market models containing contemporaneous and lagged returns. Restricted and unrestricted models are estimated using daily returns in each quarter t. Restricted model: $R_{f,d,t} = \alpha_f + \beta_{0,f} R_{mkt,d,t} + e_{f,d,t}$; Unrestricted model: $R_{f,d,t} = \alpha_f + \beta_{0,f} R_{mkt,d,t} + \beta_{1,f} R_{mkt,d-1,t} + \beta_{2,f} R_{mkt,d-2,t} + \beta_{3,f} R_{mkt,d-3,t} + \beta_{4,f} R_{mkt,d-4,t} + e_{f,d,t}$, where $R_{f,d,t}$ refers to the holding-based fund return of fund f in day d of a quarter t, and $R_{mkt,d,t}$ refers to the value-weighted market return in the same day.

Table 1: Summary Statistics

This table presents the summary statistics for the data used in the paper. The main testing sample period is between 1991 and 2010. Panel A reports the mean, median, standard deviation, and the quantile distribution of quarterly and overall dispersion proxies, mutual fund fees (annual fee before 1999 and annualized quarterly fee afterwards), monthly fund return, monthly fund flow, flow convexity, and other quarterly stock and fund characteristics. Panel B reports the correlation among the main variables above. The Appendix II provides the detailed definition of each variable. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Quantile Distribution

			Quantile Distribution				
	Mean	Std.Dev.	10%	25%	Median	75%	90%
Panel A1: Dispersion Measures							
DispSum	1.475	0.934	0.648	0.860	1.220	1.783	2.569
OHET	-0.010	0.065	-0.073	-0.042	-0.014	0.019	0.060
DispSum (Full Sample)	1.423	0.784	0.753	0.930	1.242	1.674	2.223
Panel A2: Fund Fees (in %)							
Expense Ratio	1.263	0.466	0.740	0.980	1.228	1.510	1.875
Total Fee (2-year holding period)	1.630	0.780	0.770	1.030	1.430	2.280	2.719
Total Fee (7-year holding period)	1.368	0.522	0.765	1.008	1.314	1.719	2.033
Panel A3: Fund Return (in %)							
Total Return	0.461	3.490	-4.068	-1.204	0.758	2.385	4.488
Four-factor adjusted Gross-of-Fee Return	-0.064	0.998	-1.198	-0.576	-0.055	0.446	1.058
Panel A4: Fund Flow and Flow Convexity							
Flow	1.569	9.232	-2.725	-1.308	-0.131	1.721	5.821
Flow Convexity	0.065	0.126	-0.093	-0.024	0.059	0.148	0.232
Panel A5: Stock Characteristics							
Log (Stock Size)	9.537	1.791	6.977	7.830	10.163	11.148	11.453
Num_AnalystRec	13.212	4.816	6.376	9.065	13.892	17.149	19.092
Panel A6: Fund Characteristics							
Log (Fund TNA)	5.196	2.013	2.565	3.848	5.225	6.593	7.780
Log (Fund Age)	4.471	0.973	3.219	3.912	4.533	5.069	5.670
Fund Turnover	0.877	0.769	0.190	0.360	0.690	1.133	1.720
Panel A7: Market Incompleteness Measures							
Spread	0.424	1.678	0.022	0.035	0.086	0.298	0.581
|VR-1|	0.209	0.166	0.034	0.085	0.177	0.289	0.409
Delay	0.005	0.017	-0.007	-0.002	0.001	0.007	0.020

Table 1—Continued

Panel B: Correlation among Variables

	DispSum	OHET	Expense Ratio	Four-factor adjusted Gross-of-Fee Return	Flow	Flow Convexity	Log (Stock Size)	Num _AnalystRec	Log (Fund TNA)	Log (Fund Age)	Fund Turnover	Spread	|VR-1|
OHET	0.367***	1											
Expense Ratio	0.196***	0.363***	1										
Four-factor adjusted Gross-of-Fee Return	-0.048***	-0.046***	-0.013***	1									
Flow	0.042***	0.039***	0.037***	0.011***	1								
Flow Convexity	0.107***	0.224***	0.091***	-0.018***	0.004	1							
Log (Stock Size)	-0.412***	-0.310***	-0.157***	0.021***	-0.039***	-0.080***	1						
Num_AnalystRec	-0.399***	-0.239***	-0.121***	-0.008**	-0.052***	-0.084***	0.903***	1					
Log (Fund TNA)	-0.108***	-0.255***	-0.364***	-0.021***	-0.132***	0.114***	0.133***	0.119***	1				
Log (Fund Age)	-0.094***	-0.205***	-0.182***	0.032***	-0.310***	0.015***	0.133***	0.138***	0.488***	1			
Fund Turnover	0.303***	0.302***	0.225***	0.007*	0.057***	0.074***	-0.120***	-0.073***	-0.179***	-0.117***	1		
Spread	-0.034***	-0.049***	-0.046***	0.018***	-0.009***	-0.004	0.083***	-0.004	0.072***	0.052***	-0.061***	1	
|VR-1|	0.009***	-0.011***	-0.044***	0.011***	-0.008**	-0.000	-0.045***	-0.072***	-0.000	0.031***	-0.013***	0.055***	1
Delay	0.123***	0.093***	0.053***	-0.027***	0.037***	0.024***	-0.182***	-0.194***	-0.049***	-0.055***	0.040***	-0.002	0.213***

Table 2: Dispersion of Opinion and Mutual Fund Fees

Models 1 to 4 present the results of the following quarterly Fama-MacBeth regressions, as well as their corresponding Newey-West adjusted t-statistics,

$$Fee_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Fee_{f,t}$ refers to the annualized percentage fee (expense ratio) of fund f in quarter t, $Disp_{f,t-1}$ refers to dispersion of opinion proxy, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), and fund turnover ratio. Models 5 to 8 report similar regression parameters when fund fees, dispersion proxies as well as other controls are further adjusted by netting out their style average. In Panels A and B, $Disp_{f,t-1}$ refers to dispersion proxy $DispSum_{f,t-1}$ and $OHET_{f,t-1}$ (the Appendix II provides the details). Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Out-of-sample Fees (in %) Regressed on Dispersion Index

	Fees				Style-adjusted Fees			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	1.723***	1.731***	1.804***	1.757***	-0.020***	-0.019***	-0.021***	-0.019***
	(53.73)	(53.26)	(50.61)	(44.89)	(-4.79)	(-4.66)	(-5.19)	(-4.72)
DispSum	0.052***	0.052***	0.052***	0.053***	0.046***	0.045***	0.044***	0.045***
	(11.30)	(11.30)	(11.21)	(11.11)	(9.98)	(9.91)	(9.70)	(9.69)
Spread		0.001	-0.000	0.000		0.002	0.003	0.002
		(0.05)	(-0.01)	(0.03)		(0.19)	(0.21)	(0.16)
Log (Stock Size)	-0.037***	-0.037***	-0.045***	-0.040***	-0.057***	-0.058***	-0.055***	-0.058***
	(-12.49)	(-13.05)	(-13.22)	(-9.99)	(-8.48)	(-8.70)	(-8.13)	(-8.47)
Num_AnalystRec	0.007***	0.007***	0.007***	0.007***	0.008***	0.008***	0.008***	0.008***
	(3.16)	(3.09)	(3.05)	(3.13)	(3.03)	(3.07)	(3.03)	(3.03)
Log (Fund TNA)	-0.079***	-0.080***	-0.094***	-0.080***	-0.078***	-0.078***	-0.078***	-0.078***
	(-18.64)	(-18.50)	(-15.13)	(-18.57)	(-17.34)	(-17.24)	(-17.16)	(-17.30)
Log (Fund Age)	0.014	0.013	0.013	0.013	0.017	0.017	0.016	0.017
	(1.35)	(1.29)	(1.28)	(1.31)	(1.53)	(1.47)	(1.42)	(1.47)
Fund Turnover	0.075***	0.075***	0.075***	0.045**	0.074***	0.074***	0.074***	0.074***
	(14.30)	(14.82)	(14.74)	(2.38)	(15.53)	(15.98)	(15.76)	(15.08)
Log (Stock Size) × Log (Fund TNA)			0.001***				0.009***	
			(4.58)				(7.04)	
Log (Stock Size) × Fund Turnover				0.003				-0.004
				(1.50)				(-0.82)
Adj-Rsq	0.194	0.194	0.193	0.194	0.174	0.174	0.175	0.174
Obs	80,190	80,141	80,141	80,141	80,190	80,141	80,141	80,141

Panel B: Out-of-sample Fees (in %) Regressed on Investor Heterogeneity

	Fees				Style-adjusted Fees			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	1.877***	1.889***	1.997***	1.903***	-0.021***	-0.020***	-0.023***	-0.021***
	(44.37)	(44.81)	(42.08)	(36.00)	(-5.20)	(-5.09)	(-5.90)	(-5.21)
OHET	0.123***	0.121***	0.124***	0.120***	0.102**	0.101**	0.118**	0.102**
	(3.07)	(2.99)	(3.05)	(3.00)	(2.18)	(2.13)	(2.58)	(2.17)
Spread		-0.006	-0.007	-0.007		-0.005	-0.004	-0.005
		(-0.40)	(-0.45)	(-0.45)		(-0.24)	(-0.21)	(-0.29)
Log (Stock Size)	-0.044***	-0.045***	-0.056***	-0.046***	-0.070***	-0.072***	-0.067***	-0.071***
	(-10.51)	(-11.25)	(-12.49)	(-8.77)	(-8.60)	(-8.87)	(-8.06)	(-8.74)
Num_AnalystRec	0.005**	0.005**	0.005**	0.005**	0.007**	0.007**	0.007**	0.007**
	(2.27)	(2.20)	(2.15)	(2.20)	(2.62)	(2.61)	(2.54)	(2.59)
Log (Fund TNA)	-0.081***	-0.081***	-0.102***	-0.081***	-0.079***	-0.079***	-0.080***	-0.079***
	(-18.01)	(-17.85)	(-14.58)	(-17.92)	(-16.88)	(-16.75)	(-16.71)	(-16.82)
Log (Fund Age)	0.016	0.015	0.015	0.016	0.019*	0.019	0.018	0.019
	(1.55)	(1.53)	(1.50)	(1.54)	(1.70)	(1.67)	(1.59)	(1.67)
Fund Turnover	0.092***	0.092***	0.091***	0.076***	0.089***	0.089***	0.088***	0.088***
	(15.75)	(16.14)	(15.98)	(5.01)	(15.64)	(16.13)	(15.79)	(14.86)
Log (Stock Size) × Log (Fund TNA)			0.002***				0.012***	
			(5.41)				(8.94)	
Log (Stock Size) × Fund Turnover				0.002				-0.005
				(0.99)				(-1.24)
Adj-Rsq	0.187	0.187	0.187	0.187	0.170	0.170	0.172	0.170
Obs	79,901	79,875	79,875	79,875	79,901	79,875	79,875	79,875

Table 3: Dispersion of Opinion and Gross-of-Fee Performance

This table reports the results of the following quarterly Fama-MacBeth regressions, as well as their corresponding Newey-West adjusted t-statistics,

$$\hat{\alpha}_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $\hat{\alpha}_{f,t}$ is the average monthly gross-of-fee alpha of fund f in quarter t, $Disp_{f,t-1}$ refers to the two proxies for dispersion of opinion of fund skills, $DispSum_{f,t-1}$ in Models 1 to 4 and $OHET_{f,t-1}$ in Models 5 to 8 (the Appendix II provides the details). The vector M stacks all the control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Gross-of-fee alpha is estimated using Fama-French-Carhart four-factor model with a five-year estimation period. Index and institutional funds are excluded from the analysis. The numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Four-factor Adjusted Gross-of-Fee Return (in %) Regressed on Dispersion Proxies								
	Disp = DispSum				Disp = OHET			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-0.667***	-0.667***	-0.637***	-0.557***	-0.919***	-0.918***	-0.960***	-0.783***
	(-4.93)	(-4.66)	(-3.71)	(-3.17)	(-4.21)	(-4.08)	(-3.24)	(-3.30)
Disp	-0.073***	-0.073***	-0.074**	-0.072***	-0.264**	-0.286***	-0.288***	-0.297***
	(-2.68)	(-2.71)	(-2.66)	(-2.74)	(-2.55)	(-2.71)	(-2.80)	(-3.00)
Spread		0.015	0.015	-0.005		0.004	0.006	-0.014
		(1.06)	(0.97)	(-0.20)		(0.25)	(0.37)	(-0.44)
Log (Stock Size)	0.076**	0.075**	0.070**	0.062*	0.095**	0.095**	0.097**	0.080**
	(2.51)	(2.46)	(2.13)	(1.84)	(2.51)	(2.54)	(2.18)	(2.07)
Num_AnalystRec	-0.020	-0.019	-0.019	-0.019	-0.022	-0.022	-0.022	-0.022
	(-1.31)	(-1.27)	(-1.26)	(-1.26)	(-1.40)	(-1.43)	(-1.43)	(-1.43)
Log (Fund TNA)	-0.008**	-0.008***	-0.011	-0.008***	-0.009**	-0.009**	-0.001	-0.008**
	(-2.67)	(-2.78)	(-0.71)	(-2.95)	(-2.38)	(-2.38)	(-0.04)	(-2.56)
Log (Fund Age)	0.037***	0.038***	0.037***	0.039***	0.039***	0.040***	0.040***	0.041***
	(4.07)	(4.19)	(4.26)	(4.19)	(4.29)	(4.34)	(4.35)	(4.42)
Fund Turnover	0.020	0.021	0.022	-0.130	-0.010	-0.009	-0.007	-0.187**
	(1.09)	(1.14)	(1.19)	(-1.58)	(-0.43)	(-0.40)	(-0.31)	(-2.32)
Log (Stock Size) × Log (Fund TNA)			0.001				-0.000	
			(0.35)				(-0.23)	
Log (Stock Size) × Fund Turnover				0.018*				0.021**
				(1.69)				(2.12)
Adj-Rsq	0.104	0.107	0.109	0.110	0.089	0.092	0.094	0.097
Obs	22,843	22,824	22,824	22,824	22,732	22,721	22,721	22,721

Table 4: Mutual Fund Fee and (Gross-of-Fee) Performance Relationship

Models 1 to 4 present the results of the following quarterly Fama-MacBeth regressions, as well as their corresponding Newey-West adjusted t-statistics,

$$Fee_{f,t} = \alpha_0 + \beta_1 \hat{\alpha}_{f,t-1} + \beta_2 Disp_{f,t-1} + \beta_3 \hat{\alpha}_{f,t-1} \times Disp_{f,t-1} + \beta_4 Spread_{f,t-1} + \beta_5 \hat{\alpha}_{f,t-1} \times Spread_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Fee_{f,t}$ refers to the annualized percentage fee (expense ratio) of fund f in quarter t, $\hat{\alpha}_{f,t-1}$ refers to the average monthly gross-of-fee alpha of fund f in quarter $t-1$, $Disp_{f,t-1}$ refers to dispersion of opinion proxy, $Spread_{f,t-1}$ refers to the investment-value weighted average of stock bid-ask spread for all the stocks within the holding portfolio of the fund, and the vector M stacks all other control variables, including log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. The gross-of-fee alpha is estimated using Fama-French-Carhart four-factor model with a five-year estimation period. Models 5 to 8 report similar regression parameters when fund fees, dispersion proxies as well as other controls are further adjusted by netting out their style average. In Panels A and B, $Disp_{f,t-1}$ refers to dispersion proxy $DispSum_{f,t-1}$ and $OHET_{f,t-1}$ (the Appendix II provides the details). Index and institutional funds are excluded from the analysis. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Out-of-sample Fees (in %) Regressed on Four-factor Adjusted Gross-of-Fee Return and Dispersion Index

	Fees				Style-adjusted Fees			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	2.428***	2.270***	2.272***	2.311***	0.687***	0.541***	0.545***	0.587***
	(39.50)	(34.82)	(35.41)	(35.60)	(16.04)	(11.14)	(11.23)	(12.75)
Gross-of-Fee Alpha	-0.011**	-0.007	-0.014	-0.011	-0.010**	-0.006	-0.010	-0.008
	(-2.19)	(-1.47)	(-1.60)	(-1.29)	(-2.10)	(-1.42)	(-1.32)	(-1.16)
DispSum		0.056***	0.055***	0.055***		0.050***	0.049***	0.048***
		(9.92)	(9.55)	(9.45)		(8.56)	(7.81)	(7.78)
Gross-of-Fee Alpha × DispSum			0.004	0.004			0.002	0.003
			(0.96)	(1.03)			(0.65)	(0.81)
Spread				-0.003				-0.011
				(-0.21)				(-0.43)
Gross-of-Fee Alpha × Spread				-0.015				-0.016**
				(-1.36)				(-2.11)
Fund Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj-Rsq	0.354	0.361	0.363	0.362	0.304	0.310	0.312	0.312
Obs	23,109	23,088	23,088	23,077	23,109	23,088	23,088	23,077

Panel B: Out-of-sample Fees (in %) Regressed on Four-factor Adjusted Gross-of-Fee Return and Investor Heterogeneity

	Fees				Style-adjusted Fees			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	2.428***	2.431***	2.434***	2.481***	0.687***	0.691***	0.696***	0.743***
	(39.50)	(39.45)	(40.50)	(40.44)	(16.04)	(15.97)	(16.71)	(17.98)
Gross-of-Fee Alpha	-0.011**	-0.010**	-0.009*	-0.005	-0.010**	-0.009**	-0.008*	-0.005
	(-2.19)	(-2.14)	(-1.75)	(-0.89)	(-2.10)	(-2.06)	(-1.77)	(-1.14)
OHET		0.212***	0.199***	0.199***		0.310***	0.315***	0.315***
		(2.75)	(2.84)	(2.74)		(4.20)	(4.56)	(4.51)
Gross-of-Fee Alpha × OHET			0.155	0.167*			0.121	0.127
			(1.65)	(1.81)			(1.34)	(1.43)
Spread				-0.009				-0.018
				(-0.48)				(-0.57)
Gross-of-Fee Alpha × Spread				-0.014				-0.015**
				(-1.35)				(-2.06)
Fund Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj-Rsq	0.354	0.354	0.356	0.356	0.304	0.305	0.307	0.307
Obs	23,109	23,109	23,109	23,098	23,109	23,109	23,109	23,098

Table 5: Robustness Checks on the Fee and (Gross-of-Fee) Performance Relationship

This table presents the results of the following quarterly regressions with or without dispersion of opinion,

$$Fee_{f,t} = \alpha_0 + \beta_1 \hat{\alpha}_{f,t-1} + \beta_2 Disp_{f,t-1} + \beta_3 \hat{\alpha}_{f,t-1} \times Disp_{f,t-1} + \beta_4 MktInef_{f,t-1} + \beta_5 \hat{\alpha}_{f,t-1} \times MktInef_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

$$Fee_{f,t} = \alpha_0 + \gamma_1 \hat{\alpha}_{f,t-1} + \gamma_2 MktInef_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Fee_{f,t}$ refers to the annualized percentage fee (expense ratio) of fund f in quarter t, $\hat{\alpha}_{f,t-1}$ refers to the average monthly gross-of-fee alpha of fund f in quarter $t-1$, $Disp_{f,t-1}$ refers to dispersion of opinion proxies $DispSum_{f,t-1}$ and $OHET_{f,t-1}$ (the Appendix II provides the details), $MktInef_{f,t-1}$ refers to bid-ask spread, variance ratio and market delay, and the vector M stacks all other control variables, including log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Gross-of-fee alpha is estimated using Fama-French-Carhart four-factor model with a five-year estimation period. Panel A reports the regression parameters and their clustered (by time, following Gil-Bazo and Ruiz-Verdú, 2009) or Newey-West adjusted t-statistics over the sample period from 1991 to 2010. Panel B reports similar statistics when fees and other variables are adjusted by netting out their style average. In Panel C, no-load funds are defined as those charging no front- or back-end loads. Fees for load funds are defined as the annual expense ratio plus the front-end loads divided by the assumed holding period in years. Panel D reports the regression parameters and their Newey-West adjusted t-statistics over the later period from 2001 to 2010. All OLS regressions include dummies for quarters. Index and institutional funds are excluded from the analysis. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Out-of-sample Fees (in %) Regressed on Four-factor Adjusted Gross-of-Fee Return and Dispersion Proxies									
Sample of Funds	Regression and Standard Errors	Market Inefficiency	Without Dispersion	Regressions with Dispersion in Opinions					
				Disp = DispSum			Disp = OHET		
			Alpha	Alpha	DispSum	Alpha × DispSum	Alpha	OHET	Alpha × OHET
Panel A: Regressions Using Different Standard Errors and Alternative Market Inefficiency Measures (1991–2010)									
Full Sample	FM, Newey-West	Spread	-0.011**	-0.011	0.055***	0.004	-0.005	0.199***	0.167*
			(-2.24)	(-1.29)	(9.45)	(1.03)	(-0.89)	(2.74)	(1.81)
Full Sample	FM, Newey-West	|VR−1|, Delay	-0.011**	-0.016	0.053***	0.006	-0.008	0.204***	0.172*
			(-2.25)	(-1.17)	(9.34)	(1.46)	(-0.75)	(3.11)	(1.99)
Full Sample	OLS, Clustered by Time	Spread	-0.007*	-0.006	0.054***	0.000	-0.007	0.283***	0.044
			(-1.81)	(-0.86)	(9.62)	(0.10)	(-1.52)	(4.97)	(0.70)
Panel B: Style-Adjusted Fees Regressed on Alphas (1991–2010)									
Full Sample	FM, Newey-West	Spread	-0.010**	-0.008	0.048***	0.003	-0.005	0.315***	0.127
			(-2.15)	(-1.16)	(7.78)	(0.81)	(-1.14)	(4.51)	(1.43)
Full Sample	FM, Newey-West	|VR−1|, Delay	-0.010**	-0.012	0.048***	0.004	-0.009	0.320***	0.131
			(-2.19)	(-0.92)	(7.97)	(1.04)	(-0.82)	(4.82)	(1.58)
Panel C: Sub-Sample of Funds (1991–2010)									
No-load Funds	FM, Newey-West	Spread	-0.018**	0.007	0.053***	-0.005	-0.021	1.362***	0.019
			(-2.09)	(0.22)	(4.89)	(-0.55)	(-1.31)	(8.44)	(0.13)
Load Funds	FM, Newey-West	Spread	-0.044**	-0.014	0.037**	0.003	-0.013	0.435**	0.312
(2-year holding period)			(-2.06)	(-0.32)	(2.23)	(0.25)	(-1.29)	(2.42)	(1.65)
Load Funds	FM, Newey-West	Spread	-0.031**	-0.032	0.046***	0.006	-0.015	0.296**	0.314**
(7-year holding period)			(-2.59)	(-1.40)	(3.84)	(0.76)	(-1.24)	(2.56)	(2.50)
Deciles 3−10	FM, Newey-West	Spread	-0.012**	-0.016	0.022***	0.001	-0.015	0.248***	0.043
(Exclude small funds)			(-2.18)	(-0.93)	(3.14)	(0.22)	(-1.49)	(2.98)	(0.48)
Panel D: Robustness Checks on Later Periods (2001–2010)									
Full Sample	FM, Newey-West	Spread	-0.013**	-0.008	0.059***	-0.001	-0.011*	0.260***	0.168
			(-2.22)	(-0.82)	(7.67)	(-0.14)	(-1.87)	(2.91)	(1.36)
Full Sample	FM, Newey-West	|VR−1|, Delay	-0.014**	-0.005	0.056***	0.002	-0.005	0.237***	0.179
			(-2.35)	(-0.33)	(7.31)	(0.35)	(-0.38)	(2.85)	(1.53)

Table 6: Dispersion of Opinion and Mutual Fund Flows

This table reports the results of the following quarterly Fama-MacBeth regressions, as well as their corresponding Newey-West adjusted t-statistics,

$$Flow_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + \beta_2 Rank_{f,t-1} + \beta_3 Disp_{f,t-1} \times Rank_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Flow_{f,t}$ is the average monthly flow of fund f in quarter t, $Disp_{f,t-1}$ refers to the two proxies for dispersion of opinion of fund skills, $DispSum_{f,t-1}$ in Models 1 to 4 and $OHET_{f,t-1}$ in Models 5 to 8 (the Appendix II provides the details). $Rank_{f,t-1}$ is the fund rank (Low/Med/High) based on a function of lagged fund returns, and the vector M stacks all the control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. At the beginning of each quarter, we rank all the mutual funds according to their lagged returns, and normalize the ranks to follow a [0, 1] uniform distribution. Low is defined as $Rank$ if $Rank \leq 0.3$, Med is defined as $Rank - 0.3$ if $0.3 < Rank \leq 0.7$, $High$ is defined as $Rank - 0.7$ if $0.7 < Rank \leq 1$. The numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Out-of-sample Flow (in %) Regressed on Dispersion Proxies								
	Disp = DispSum				Disp = OHET			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	6.158***	6.209***	9.619***	5.252***	3.373***	3.404***	4.294***	3.240***
	(8.31)	(8.62)	(7.90)	(6.02)	(6.80)	(6.89)	(6.37)	(5.46)
Disp	-0.240**	-0.230**	-0.236**	-0.244**	-1.154**	-1.148**	-1.128*	-1.171**
	(-2.15)	(-2.06)	(-2.13)	(-2.15)	(-2.04)	(-2.02)	(-1.98)	(-2.04)
Low	-0.028	0.074	0.085	0.006	-0.385**	-0.383**	-0.387**	-0.373**
	(-0.05)	(0.13)	(0.15)	(0.01)	(-2.48)	(-2.49)	(-2.53)	(-2.44)
Med	1.203**	1.237***	1.201**	1.133**	2.176***	2.164***	2.164***	2.159***
	(2.58)	(2.74)	(2.64)	(2.50)	(8.11)	(8.11)	(8.12)	(8.16)
High	7.559***	7.657***	7.766***	7.597***	8.465***	8.457***	8.461***	8.455***
	(5.84)	(5.91)	(5.94)	(5.64)	(10.20)	(10.15)	(10.08)	(10.40)
Low × Disp	-0.112	-0.166	-0.159	-0.099	-0.872	-0.742	-0.950	-0.498
	(-0.24)	(-0.36)	(-0.35)	(-0.22)	(-0.29)	(-0.25)	(-0.31)	(-0.17)
Med × Disp	0.760**	0.731**	0.757**	0.795***	4.719	4.783	4.543	4.866
	(2.52)	(2.51)	(2.61)	(2.76)	(1.29)	(1.30)	(1.23)	(1.32)
High × Disp	1.721***	1.661***	1.608***	1.638***	10.877**	10.863**	10.935**	11.096**
	(3.77)	(3.72)	(3.70)	(3.58)	(2.07)	(2.06)	(2.09)	(2.10)
Spread		0.268**	0.285**	0.296**		0.113**	0.115**	0.110**
		(2.03)	(2.20)	(2.31)		(2.07)	(2.08)	(2.01)
Log (Stock Size)	0.153	0.129	-0.219*	0.231**	0.190***	0.179**	0.090	0.197***
	(1.63)	(1.36)	(-1.82)	(2.59)	(2.81)	(2.65)	(1.50)	(3.04)
Num_AnalystRec	-0.068**	-0.059*	-0.064*	-0.058*	-0.062**	-0.059**	-0.060**	-0.059**
	(-2.08)	(-1.74)	(-1.97)	(-1.68)	(-2.26)	(-2.07)	(-2.15)	(-2.09)
Log (Fund TNA)	-0.036	-0.037*	-0.717***	-0.032	0.070***	0.069***	-0.105	0.069***
	(-1.64)	(-1.67)	(-5.50)	(-1.43)	(4.25)	(4.19)	(-1.53)	(4.24)
Log (Fund Age)	-1.347***	-1.347***	-1.349***	-1.349***	-1.038***	-1.039***	-1.038***	-1.039***
	(-11.56)	(-11.55)	(-11.59)	(-11.66)	(-11.47)	(-11.47)	(-11.42)	(-11.53)
Fund Turnover	0.334***	0.343***	0.330***	1.653***	-0.120**	-0.117**	-0.122**	0.061
	(3.38)	(3.41)	(3.22)	(2.97)	(-2.12)	(-2.05)	(-2.12)	(0.29)
Log (Stock Size) × Log (Fund TNA)			0.071***				0.018**	
			(5.21)				(2.59)	
Log (Stock Size) × Fund Turnover				-0.147**				-0.018
				(-2.52)				(-0.97)
Adj-Rsq	0.120	0.120	0.122	0.124	0.131	0.132	0.132	0.132
Obs	78,756	78,707	78,707	78,707	76,093	76,091	76,091	76,091

Table 7: Dispersion of Opinion and the Convex Flow-Performance Sensitivity

Models 1 to 4 present the results of the following cross-sectional regressions, as well as their corresponding robust t-statistics,

$$FlowConvexity_f = \alpha_0 + \beta_1 \overline{Disp}_f + c\overline{M}_f + e_f,$$

where $FlowConvexity_f$ is the flow convexity of fund f, $\overline{Disp}_f$ refers to the dispersion of opinion proxy computed over the entire sample period, and the vector $\overline{M}$ stacks the sample average of all control variables, including the bid-ask spread, market delay, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Flow convexity is estimated for each fund over the entire sample period as follows: $FlowConvexity_f = Corr(Flow_{f,m}, Rank_{f,m-1}{}^2)$, in which $Flow_{f,m}$ is the monthly flow of fund f in month m, $Rank_{f,m-1}$ is the rank of style-adjusted fund returns, and the ranks are normalized to follow a [0, 1] uniform distribution. Models 5 to 8 report similar regression parameters when flow convexity, dispersion proxies as well as other controls are further adjusted by netting out their style average. In Panels A and B, $Disp_f$ refers to dispersion proxy $DispSum_f$ and $OHET_f$ (the Appendix II provides the details). Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Flow Convexity Regressed on Dispersion Index

	Flow Convexity				Style-adjusted Flow Convexity			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	0.003	0.004	-0.007	0.002	0.001	0.001	0.001	0.001
	(0.10)	(0.14)	(-0.13)	(0.06)	(0.54)	(0.52)	(0.40)	(0.49)
DispSum	0.012***	0.012***	0.012***	0.012***	0.014***	0.014***	0.014***	0.014***
	(2.78)	(2.78)	(2.78)	(2.79)	(2.93)	(2.93)	(2.90)	(2.95)
Spread		0.001	0.001	0.001		-0.000	-0.000	-0.000
		(0.21)	(0.22)	(0.21)		(-0.05)	(-0.03)	(-0.05)
Log (Stock Size)	0.006	0.006	0.007	0.006	0.005	0.005	0.005	0.005
	(1.60)	(1.51)	(1.15)	(1.39)	(0.93)	(0.93)	(0.99)	(0.88)
Num_AnalystRec	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003**	-0.003*
	(-2.13)	(-2.05)	(-2.05)	(-2.05)	(-2.01)	(-1.99)	(-1.97)	(-1.96)
Log (Fund TNA)	0.012***	0.012***	0.014	0.012***	0.012***	0.012***	0.012***	0.012***
	(7.28)	(7.26)	(1.51)	(7.26)	(7.13)	(7.11)	(6.90)	(7.11)
Log (Fund Age)	-0.010***	-0.010***	-0.010***	-0.011***	-0.010**	-0.010**	-0.010**	-0.010**
	(-2.64)	(-2.65)	(-2.65)	(-2.66)	(-2.50)	(-2.50)	(-2.52)	(-2.49)
Fund Turnover	0.018***	0.018***	0.018***	0.019	0.014***	0.014***	0.014***	0.013***
	(4.51)	(4.51)	(4.51)	(0.83)	(3.22)	(3.21)	(3.18)	(3.09)
Log (Stock Size) × Log (Fund TNA)			-0.000				0.002	
			(-0.24)				(0.92)	
Log (Stock Size) × Fund Turnover				-0.000				-0.003
				(-0.08)				(-0.78)
Adj-Rsq	0.043	0.043	0.043	0.043	0.038	0.038	0.038	0.038
Obs	2,347	2,347	2,347	2,347	2,347	2,347	2,347	2,347

Panel B: Flow Convexity Regressed on Investor Heterogeneity

	Flow Convexity				Style-adjusted Flow Convexity			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	0.040*	0.042*	0.030	0.042	0.001	0.001	0.001	0.001
	(1.70)	(1.74)	(0.56)	(1.34)	(0.59)	(0.59)	(0.45)	(0.54)
OHET	0.168***	0.169***	0.169***	0.169***	0.163***	0.163***	0.165***	0.165***
	(3.75)	(3.75)	(3.75)	(3.75)	(3.60)	(3.60)	(3.64)	(3.63)
Spread		0.001	0.001	0.001		0.000	0.000	0.000
		(0.31)	(0.32)	(0.31)		(0.00)	(0.03)	(0.01)
Log (Stock Size)	0.007*	0.006	0.007	0.006	0.002	0.002	0.002	0.001
	(1.71)	(1.59)	(1.24)	(1.41)	(0.33)	(0.32)	(0.41)	(0.27)
Num_AnalystRec	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(-2.92)	(-2.80)	(-2.81)	(-2.80)	(-2.73)	(-2.67)	(-2.64)	(-2.64)
Log (Fund TNA)	0.012***	0.012***	0.014	0.012***	0.012***	0.012***	0.012***	0.012***
	(7.25)	(7.23)	(1.56)	(7.22)	(7.29)	(7.27)	(7.05)	(7.26)
Log (Fund Age)	-0.013***	-0.013***	-0.013***	-0.013***	-0.012***	-0.012***	-0.012***	-0.012***
	(-3.19)	(-3.21)	(-3.21)	(-3.21)	(-3.04)	(-3.05)	(-3.06)	(-3.04)
Fund Turnover	0.019***	0.019***	0.019***	0.019	0.016***	0.016***	0.016***	0.016***
	(5.11)	(5.12)	(5.12)	(0.81)	(4.04)	(4.03)	(3.99)	(3.91)
Log (Stock Size) × Log (Fund TNA)			-0.000				0.002	
			(-0.27)				(1.12)	
Log (Stock Size) × Fund Turnover				0.000				-0.004
				(0.00)				(-0.85)
Adj-Rsq	0.048	0.048	0.048	0.048	0.041	0.041	0.042	0.042
Obs	2,345	2,345	2,345	2,345	2,345	2,345	2,345	2,345

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Short-Sale Constraints and the Pricing of Managerial Skills

Internet Appendix

In this Appendix we first extend the model to allow for learning over time. We then conduct two sets of robustness checks that could provide more economic intuitions to us. In the first set of robustness checks, we replace the overall dispersion proxy *DispSum* by its two economic sources, and examine how holding-level dispersion of opinion (*DispAnalyst*) and return gap uncertainty (*DispGap*) affect fees, fee-performance relationship and flow convexity. In the second set of robustness checks, we construct two additional proxies to capture dispersion of opinion among fund investors. The two proxies are: 1) performance dispersion in the time series and 2) the number of share classes offered by a same fund. The first proxy increases learning difficulty in a same way as *DispGap*, which enhances potential disagreements among investors. The second proxy follows Ferson and Lin (2014).

1. Extension of the Model To Allow For Learning Over Time

We first allow investors to learn about their managers from history in addition to what they directly observe. Such learning is meaningful only when managerial skills (or managerial endowments in our model) persist across periods. To capture this persistence, we assume that the four endowment scenarios transit across periods via a Markov chain: $\theta_t = \theta_{t-1}P$, where θ_t is the state variable of managerial endowments and P is the transition matrix.[1]

We further assume that the transition matrix is known to the public. Then, without loss of generality, we can model the learning effect as the probability that each type of investor observes *both* managerial signals before investing. That is, while investors in general only observe their private information in a given period (Assumption 2A), they can, with probability Q, also infer from history the missing part of their private signal (in which case Assumption 2B applies). In other words, conditions described by Assumptions 2A and 2B will occur with probability $1 - Q$ and Q, respectively. Moreover, the higher the persistence level of the Markov chain, the higher the value of Q when investors can effectively learn from history. These conditions are summarized as follows.

[1] Mathematically, we can stack the four scenarios of managerial endowments together to define the state variable. In this case, θ_t can take one of the four values in a given period, denoted as $\theta_1 \ldots \theta_4$, to indicate the occurrence of a specific scenario. For instance, $\theta_2 = \{0\ 1\ 0\ 0\}'$ indicates that the second scenario of $\{\phi(s) = 0, \phi(m) = \alpha\}$ has been realized. Each element of P then denotes the probability that state j follows state i: i.e., $P_{i,j} = Prob(\theta_t = \theta_j | \theta_{t-1} = \theta_i)$.

ASSUMPTION 5 *(learning over periods): If we denote the probability for each type of investor to observe both managerial signals in a given period as Q (i.e., Assumptions 2A and 2B apply to the current generation with probabilities of $1 - Q$ and Q, respectively), then a more persistent Markov transition matrix increases the probability of Q.*

Based on this additional assumption, the following proposition states that the conclusions obtained based on a representative generation (including Propositions 1 and 2, and Corollary 1) will not be eliminated if learning over periods is permitted, provided the cross-period Markov transition is not perfectly persistent.

PROPOSITION 3 *(multiple-period economy): The effects of dispersion of opinion on the pricing of managerial skills remain valid in a multiple-period setup as long as managerial skills are not perfectly persistent.*

Proof (Proposition 3): Because the four states of the nature are symmetric (i.e., $P_{i,i} = P_{j,j}$), we can quantify the persistence of P, among others, by using a variable $y = (Tr\{P\} - 1)/4$. It is easy to see that $y \in [0,1]$. Furthermore, the Markov chain is purely random when $y = 0$ (i.e., $P_{i,j} = 25\%$) and absorbing when $y = 1$ ($P_{i,i} = 100\%$). In general, persistence of managerial endowments increases in the value of y. According to Assumption 5, persistence in the Markov process increases the probability Q that investors are fully informed. That is, $Q(y = 0) = 0$, $Q(y = 1) = 1$, and $\frac{\partial Q}{\partial y} > 0$.[2]

Because the Markov chain is public information, the manager can replicate the information set for each type of investors and know whether the generation of investors is fully informed when the fund is launched. If the investors remain partially informed and exhibit dispersion of opinion, then the manager will solve problem (A1); otherwise, investors have complete information, and the manager solves problem (A2). Hence, the intuitions provided by the previous propositions are unchanged, provided that

[2] That is, if P is absorbing (i.e., $y = 1$), performance is perfectly persistent after its initial endowment. In this case, investors obtain complete information from history. If P is purely random (i.e., $y = 0$), such learning does not add any new information. In between, investors can learn from the ergodic probability of each state in the long run, denoted as $\pi = \{\pi_1, \ldots, \pi_4\}$, by solving the equation of $P\pi = \pi$. The more persistent P is, the more the ergodic probability helps investors learn about the realized state of their investment period, in addition to their partial signal.

the probability that the second case will occur is less than 100% (i.e., when the Markov chain is not absorbing or when the managerial endowment is not perfectly persistent). Q.E.D. ▪

The most important intuition of Proposition 3 is that the learning equilibrium can be regarded as a linear combination (in terms of probability distribution) of the equilibrium with dispersion of opinion and the benchmark equilibrium without dispersion of opinion. The weight of the benchmark equilibrium captures the learning effect.

This intuition allows us to derive two general implications. First, theoretically speaking, as long as fund performance is not perfectly persistent, learning is incomplete, in which case the equilibrium with dispersion of opinion occurs with a positive probability. Since fund performance is not persistent in the long run in practice (e.g., Carhart 1997), the probability for the dispersion equilibrium to occur is high. Hence, allowing for learning is unlikely to absorb the predictions of Proposition 1, Corollary 1, and Proposition 2 regarding mutual fund fees, performance, and flows.

The second implication is that a higher degree of time-series variation in fund performance, which comes from a less persistent Markov chain, will weaken the learning effect and increase the probability for the equilibrium with dispersion of opinion to occur. Hence, we can use the degree of time-series variation in fund performance as an empirical proxy for the effect of dispersion of opinion—the more the time-series variation in fund performance, the more significant the effect of dispersion of opinion. This property completes the logic for the construction of the *DispGap* measure in our main text.

2. Additional Robustness Checks

In Table A1, we re-estimate the fee regressions using the two components of overall dispersion of opinion. Panel A uses unadjusted fees as the dependent variable, while in Panel B, all variables are adjusted by netting out their style average. The results are similar to those seen from our main dispersion proxies, that is, dispersion of opinion allows funds to charge higher fees. For instance, a one-standard-deviation higher dispersion of *DispAnalyst* (*DispGap*) is related to 3.2 (11.2) bps higher annual fees (Panel A, Model 6). Hence, the joint impact of the two components can amount to 14.4 bps.

Next, we examine the fee-performance relationship using the decomposed measures dispersion of opinion. The results are reported in Table A2, and the layout of the table is similar as in Table 5. The first three columns specify the sample, regression condition, and alternative proxy of market inefficiency of the tests. The next column reports the regression parameter between fees and alpha when market inefficiency and other control variables are included. In the interest of brevity, we tabulate only the coefficient for alpha. The other columns tabulate the regression parameters for alpha, *DispAnalyst*, *DispGap*, and the interactions between two dispersion proxies and alpha.

The results are consistent with the ones we reported in the paper, and show a negative relationship between performance and fees. Such a relationship in general disappears when we control for dispersion of opinion. In contrast, the relationship between fees and dispersion of opinion is consistently positive across all the alternative specifications. It is also interesting to note that in later periods (i.e., 2001–2010 of the sample), as reported in Panel D, the relationship between α and fees actually becomes positive, as standard economic theory (e.g., Berk and Green, 2004) predicts. Overall, these results are in line with our working hypotheses.

In Table A3, we first confirm the interim prediction that dispersion of opinion is in general negatively related to fund flows. Models 1 to 4 use unadjusted flow as the dependent variable, while in Models 5 to 8 we adjust all the variables by subtracting their style average. More importantly, dispersion of opinion allows funds to attract disproportionally large inflows following superior performance, enhancing the convex relationship between flows and performance. If we focus on Model 2, for instance, we see that a one-standard-deviation higher *DispGap* is related to 2.16% lower flows per year, and 4.43% higher annualized flows for funds ranking high in performance.

As additional (unreported) robustness check we also perform a test by using, as a proxy for investor demand, the TNA-growth of the fund as opposed to its flows. The benefit of this variable is that it synchronizes the growth impacts of both flows and fund return and prevents funds from using strategies that attract flows but destroy returns. Since the findings are qualitatively and quantitatively similar, in the interest of brevity, we do not tabulate them here.

In Table A4, we further quantify the long-term impact of dispersion of opinion on flow convexity. Panel A reports the regression parameters and their robust t-statistics. Panel B reports similar statistics when all variables, including convexity and independent variables, are further adjusted by netting out the style average. The results display a strong positive correlation between dispersion of opinion and fund flow convexity, a correlation that holds across different specifications and is economically significant. In Panel A, Model 6, a one-standard-deviation increase in full sample *DispAnalyst* (*DispGap*) is related to a 0.0094 (0.0064) increase in flow convexity,[3] which amounts to 14.5% (9.9%) of the average flow convexity observed in the sample (the average flow convexity in the full sample being 0.065). Hence, their joint impact could account for more than 24% of the average flow convexity. Overall, these findings illustrate a channel through which dispersion of opinion enhances flow convexity.

In the second set of robustness checks, we construct two more measures to capture the overall dispersion of opinion among fund investors. The first measure is performance dispersion constructed as follows:

$$DispPerf_{f,t} = \sqrt{\sum_{m \in t}(r_{f,m} - r_{BMK,m})^2 / 3}, \tag{A1}$$

where $r_{f,m}$ and $r_{BMK,m}$ refer to the total return of fund f in month m of a quarter t and the return of the benchmark index. The intuition is that investors often benchmark fund returns against the indices that funds track. While a (positive) difference between fund return and benchmark return signals managerial skills, a wider distribution of such skills, again, gives rise to more disagreements among investors by making it more difficult for investors to learn and agree. This measure is in spirit similar to $DispGap_{f,t}$ but synchronized with more information.

Dispersion of opinion is also related to the investor heterogeneity based on the various share classes issued by a fund (e.g., Ferson and Lin, 2014). Our second dispersion proxy, $DispShr_{f,t}$, is defined as the number of share classes offered by fund f in quarter t. A fund with many share classes could potentially attract investors with different backgrounds and preferences, and they are more likely to disagree with

[3] I.e., $0.16 \times 0.059 = 0.0094$, where 0.059 is the standard deviation of *DispAnalyst* in the full sample.

each other, leading to more diverse opinions. Our results are robust if we only consider the number of retail share classes.

For brevity, we only report the main results on fees and fee-performance relationship. In Table A5, we focus on the impact of dispersion of opinion on mutual fund fees, Panel A for *DispPerf* and Panel B for *DispShr*. The layout of the table is similar as in Table 2. We find that dispersion of opinion is positively related to higher fees, a result that holds across the different specifications and is economically significant. In Model 2 of Panel A (Panel B), a one-standard-deviation higher dispersion of *DispPerf* (*DispShr*) is related to 13.7 (16.1) bps higher annual fees. To appreciate the magnitude of the fee increase, we can compare it to the average annual expense ratio of funds in our sample: 1.26%. In this case, 13.7 (16.1) bps represents a 11% (13%) increase in fees. Given that the mutual fund industry manages trillions of dollars in assets, the total additional fees that optimistic investors pay are substantial. Again, the second moment of fund performance, *DispPerf*, can also be interpreted as risk. However, if mutual investors are in general risk averse, they will not be willing to pay a higher fee to a fund simply because its performance is more risky. Rather, we argue that in this case the second moment proxies the difficulty for learning, which contributes to dispersion of opinion. Note that learning may effectively attract more risk tolerant investors who are willing to pay a higher fee for funds with higher *DispPerf*, but this is consistent with our intuition that funds use fee to attract only a fraction of optimistic investors, except that optimism in this case is measured by the level of risk tolerance.

In Table A6, we re-estimate the fee-performance relationship using the two alternative measures of overall dispersion of opinion. The layout of the table is similar as in Table 5. The first three columns specify the sample, regression condition, and the alternative proxies of market inefficiency of the tests. The next column reports the regression parameter between fee and alpha when market inefficiency and other control variables are included. The next three other columns tabulate the regression parameters for alpha, *DispPerf*, and the interaction between *DispPerf* and alpha. Finally, the last three columns tabulate the regression parameters for alpha, *DispShr*, and the interaction between *DispShr* and alpha.

The results are consistent with the ones we reported in the paper, and show a negative relationship between performance and fees. Such a relationship in general disappears when we control for dispersion of opinion. In contrast, the relationship between fees and dispersion of opinion is consistently positive across all the alternative specifications. Overall, these results are in line with our working hypotheses.

Table A1: Robustness Checks on Dispersion of Opinion and Mutual Fund Fees (*DispAnalyst* and *DispGap*)

Panel A presents the results of the following quarterly Fama-MacBeth regressions, as well as their corresponding Newey-West adjusted t-statistics,

$$Fee_{f,t} = \alpha_0 + \beta_1 DispAnalyst_{f,t-1} + \beta_2 DispGap_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Fee_{f,t}$ refers to the annualized percentage fee (expense ratio) of fund f in quarter t, $DispAnalyst_{f,t-1}$ is the standard deviation of analysts' earnings forecast, scaled by the absolute value of average forecast in that quarter, $DispGap_{f,t-1}$ is the square root of average monthly return gap square in a quarter, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Panel B reports similar regression parameters when fund fees, dispersion proxies as well as other controls are adjusted by netting out their style average. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Out-of-sample Fees (in %) Regressed on Dispersion Proxies								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	1.796***	1.787***	1.721***	1.805***	1.794***	1.727***	1.773***	1.746***
	(47.33)	(42.4)	(48.55)	(45.57)	(41.31)	(45.66)	(46.88)	(39.67)
DispAnalyst	0.404***		0.317***	0.408***		0.321***	0.321***	0.319***
	(5.74)		(4.65)	(5.81)		(4.71)	(4.71)	(4.72)
DispGap		0.059***	0.059***		0.059***	0.059***	0.059***	0.059***
		(9.45)	(9.14)		(9.42)	(9.11)	(9.10)	(9.08)
Spread				-0.001	-0.002	-0.001	-0.002	-0.001
				(-0.06)	(-0.20)	(-0.16)	(-0.21)	(-0.1)
Log (Stock Size)	-0.044***	-0.043***	-0.041***	-0.045***	-0.043***	-0.041***	-0.046***	-0.043***
	(-12.5)	(-14.41)	(-15.42)	(-13.44)	(-15.34)	(-16.70)	(-14.29)	(-11.71)
Num_AnalystRec	0.008***	0.008***	0.009***	0.008***	0.007***	0.008***	0.009***	0.009***
	(3.81)	(4.10)	(4.39)	(3.81)	(4.02)	(4.35)	(4.36)	(4.39)
Log (Fund TNA)	-0.081***	-0.077***	-0.077***	-0.081***	-0.077***	-0.078***	-0.086***	-0.078***
	(-18.93)	(-18.02)	(-18.79)	(-18.78)	(-17.78)	(-18.53)	(-14.59)	(-18.58)
Log (Fund Age)	0.015	0.013	0.013	0.015	0.012	0.013	0.012	0.013
	(1.50)	(1.23)	(1.26)	(1.43)	(1.17)	(1.20)	(1.19)	(1.21)
Fund Turnover	0.091***	0.075***	0.074***	0.090***	0.075***	0.073***	0.073***	0.052***
	(15.74)	(14.83)	(14.02)	(16.17)	(15.22)	(14.42)	(14.37)	(2.96)
Log (Stock Size) × Log (Fund TNA)							0.001**	
							(2.44)	
Log (Stock Size) × Fund Turnover								0.002
								(1.13)
Adj-Rsq	0.187	0.199	0.202	0.188	0.200	0.202	0.202	0.202
Obs	80,873	80,437	80,383	80,827	80,391	80,337	80,337	80,337
Panel B: Out-of-sample Style-adjusted Fees (in %) Regressed on Style-adjusted Dispersion Proxies								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-0.020***	-0.019***	-0.018***	-0.019***	-0.018***	-0.017***	-0.019***	-0.018***
	(-4.78)	(-4.40)	(-4.25)	(-4.61)	(-4.26)	(-4.10)	(-4.53)	(-4.16)
DispAnalyst	0.370***		0.298***	0.374***		0.301***	0.302***	0.300***
	(5.98)		(4.77)	(6.05)		(4.84)	(4.80)	(4.81)
DispGap		0.055***	0.056***		0.055***	0.055***	0.054***	0.055***
		(8.99)	(8.68)		(9.00)	(8.70)	(8.58)	(8.64)
Spread				0.001	-0.001	-0.001	-0.000	-0.000
				(0.08)	(-0.18)	(-0.07)	(-0.05)	(-0.06)
Log (Stock Size)	-0.067***	-0.056***	-0.053***	-0.069***	-0.057***	-0.054***	-0.051***	-0.054***
	(-9.86)	(-9.04)	(-9.42)	(-10.24)	(-9.54)	(-9.97)	(-9.23)	(-9.74)
Num_AnalystRec	0.010***	0.008***	0.009***	0.010***	0.008***	0.009***	0.009***	0.009***
	(3.64)	(3.42)	(3.71)	(3.74)	(3.47)	(3.79)	(3.75)	(3.76)
Log (Fund TNA)	-0.079***	-0.076***	-0.076***	-0.079***	-0.076***	-0.076***	-0.077***	-0.076***
	(-17.52)	(-17.02)	(-17.63)	(-17.39)	(-16.84)	(-17.43)	(-17.33)	(-17.49)
Log (Fund Age)	0.018	0.016	0.016	0.017	0.015	0.015	0.015	0.015
	(1.63)	(1.37)	(1.41)	(1.56)	(1.31)	(1.35)	(1.31)	(1.35)
Fund Turnover	0.087***	0.073***	0.072***	0.087***	0.073***	0.072***	0.072***	0.071***
	(16.22)	(15.82)	(15.25)	(16.58)	(16.17)	(15.59)	(15.39)	(14.77)
Log (Stock Size) × Log (Fund TNA)							0.008***	
							(5.93)	
Log (Stock Size) × Fund Turnover								-0.003
								(-0.66)
Adj-Rsq	0.169	0.179	0.181	0.170	0.179	0.181	0.182	0.182
Obs	80,873	80,437	80,383	80,827	80,391	80,337	80,337	80,337

Table A2: Robustness Checks on the Fee and (Gross-of-Fee) Performance Relationship (*DispAnalyst* and *DispGap*)

This table presents the results of the following quarterly regressions with or without dispersion of opinion,

$$Fee_{f,t} = \alpha_0 + \beta_1 \hat{\alpha}_{f,t-1} + \beta_2 Disp_{f,t-1} + \beta_3 \hat{\alpha}_{f,t-1} \times Disp_{f,t-1} + \beta_4 MktInef_{f,t-1} + \beta_5 \hat{\alpha}_{f,t-1} \times MktInef_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

$$Fee_{f,t} = \alpha_0 + \gamma_1 \hat{\alpha}_{f,t-1} + \gamma_2 MktInef_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Fee_{f,t}$ refers to the annualized percentage fee (expense ratio) of fund f in quarter t, $\hat{\alpha}_{f,t-1}$ refers to the average monthly gross-of-fee alpha of fund f in quarter $t-1$, $Disp_{f,t-1}$ refers to two dispersion proxies $DispAnalyst_{f,t-1}$ and $DispGap_{f,t-1}$ (the Appendix II provides the details), $MktInef_{f,t-1}$ refers to bid-ask spread, variance ratio and market delay, and the vector M stacks all other control variables, including log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Gross-of-fee alpha is estimated using Fama-French-Carhart four-factor model with a five-year estimation period. Panel A reports the regression parameters and their clustered (by time, following Gil-Bazo and Ruiz-Verdú, 2009) or Newey-West adjusted t-statistics over the sample period from 1991 to 2010. Panel B reports similar statistics when fees and other variables are adjusted by netting out their style average. In Panel C, no-load funds are defined as those charging no front- or back-end loads. Fees for load funds are defined as the annual expense ratio plus the front-end loads divided by the assumed holding period in years. Panel D reports the regression parameters and their Newey-West adjusted t-statistics over the later period from 2001 to 2010. All OLS regressions include dummies for quarters. Index and institutional funds are excluded from the analysis. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Out-of-sample Fees (in %) Regressed on Four-factor Adjusted Gross-of-Fee Return and Dispersion Proxies								
Sample of Funds	Regression and Standard Errors	Market Inefficiency	Without Dispersion	Regressions with Dispersion of Opinion				
			Alpha	Alpha	DispAnalyst	DispGap	Alpha × DispAnalyst	Alpha × DispGap
Panel A: Regressions Using Different Standard Errors and Alternative Market Inefficiency Measures (1991 – 2010)								
Full Sample	FM, Newey-West	Spread	-0.011**	-0.005	0.307***	0.054***	-0.084	-0.002
			(-2.24)	(-0.31)	(4.10)	(5.78)	(-1.08)	(-0.52)
Full Sample	FM, Newey-West	|VR-1|, Delay	-0.011**	-0.008	0.263***	0.054***	-0.068	-0.000
			(-2.25)	(-0.55)	(3.53)	(5.64)	(-0.89)	(-0.08)
Full Sample	OLS, Clustered by Time	Spread	-0.007*	-0.007	0.249***	0.044***	-0.075**	0.001
			(-1.81)	(-0.92)	(7.00)	(10.58)	(-2.40)	(0.38)
Panel B: Style-Adjusted Fees Regressed on Alphas (1991 – 2010)								
Full Sample	FM, Newey-West	Spread	-0.010**	0.005	0.353***	0.057***	-0.105	-0.005
			(-2.15)	(0.37)	(5.63)	(5.72)	(-1.25)	(-1.12)
Full Sample	FM, Newey-West	|VR-1|, Delay	-0.010**	-0.000	0.322***	0.057***	-0.081	-0.003
			(-2.19)	(-0.02)	(5.31)	(5.58)	(-1.00)	(-0.65)
Panel C: Sub-Sample of Funds (1991 – 2010)								
No-load Funds	FM, Newey-West	Spread	-0.018**	0.014	0.281***	0.072***	-0.104	0.006
			(-2.09)	(0.62)	(2.94)	(6.16)	(-1.35)	(0.59)
Load Funds	FM, Newey-West	Spread	-0.044**	-0.024	0.513**	0.067***	-0.067	0.006
(2-year holding period)			(-2.06)	(-0.59)	(2.63)	(3.55)	(-0.47)	(0.52)
Load Funds	FM, Newey-West	Spread	-0.031**	-0.010	0.414***	0.058***	-0.052	0.004
(7-year holding period)			(-2.59)	(-0.38)	(3.83)	(4.57)	(-0.41)	(0.41)
Deciles 3–10	FM, Newey-West	Spread	-0.012**	-0.012	0.014	0.049***	-0.034	0.004
(Exclude small funds)			(-2.18)	(-0.78)	(0.18)	(4.99)	(-0.48)	(1.17)
Panel D: Robustness Checks on Later Periods (2001 – 2010)								
Full Sample	FM, Newey-West	Spread	-0.013**	0.017*	0.463***	0.055***	-0.174***	-0.006
			(-2.22)	(1.84)	(5.74)	(7.53)	(-5.08)	(-1.02)
Full Sample	FM, Newey-West	|VR-1|, Delay	-0.014**	0.015	0.415***	0.054***	-0.149***	-0.002
			(-2.35)	(0.95)	(5.15)	(6.96)	(-4.08)	(-0.35)

Table A3: Robustness Checks on Dispersion of Opinion and Mutual Fund Flows (*DispAnalyst* and *DispGap*)

Models 1 to 4 report the results of the following quarterly Fama-MacBeth regressions, as well as their corresponding Newey-West adjusted t-statistics,

$$Flow_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + \beta_2 Rank_{f,t-1} + \beta_3 Disp_{f,t-1} \times Rank_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Flow_{f,t}$ is the average monthly flow of fund f in quarter t, $Disp_{f,t-1}$ refers to the two proxies for dispersion of opinion of fund skills, $DispAnalyst_{f,t-1}$ and $DispGap_{f,t-1}$ (the Appendix II provides the detailed definition). $Rank_{f,t-1}$ is the fund rank (Low/Med/High) based on a function of lagged fund returns, and the vector M stacks all the control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. At the beginning of each quarter, we rank all the mutual funds according to their lagged returns, and normalize the ranks to follow a [0, 1] uniform distribution. Low is defined as $Rank$ if $Rank \leq 0.3$, Med is defined as $Rank - 0.3$ if $0.3 < Rank \leq 0.7$, $High$ is defined as $Rank - 0.7$ if $0.7 < Rank \leq 1$. Models 5 to 8 report similar regression parameters when fund flow, dispersion proxies as well as other controls are further adjusted by netting out their style average. The numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Out-of-sample Flow (in %) Regressed on Dispersion Proxies								
	Flow				Style-adjusted Flow			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	4.022***	4.022***	6.008***	3.617***	-3.760***	-3.698***	-3.706***	-3.694***
	(7.58)	(7.74)	(6.13)	(5.89)	(-6.55)	(-6.8)	(-6.79)	(-6.77)
DispAnalyst	0.270	0.278	0.267	0.273	-0.936	-0.665	-0.702	-0.778
	(0.22)	(0.23)	(0.22)	(0.22)	(-0.43)	(-0.3)	(-0.32)	(-0.35)
DispGap	-0.096**	-0.095**	-0.102**	-0.097**	-0.211**	-0.220**	-0.235**	-0.214*
	(-2.14)	(-2.15)	(-2.34)	(-2.16)	(-2.05)	(-2.06)	(-2.14)	(-1.99)
Low	-0.691	-0.717	-0.715	-0.721	0.430	0.451	0.479	0.418
	(-1.53)	(-1.61)	(-1.6)	(-1.59)	(0.74)	(0.77)	(0.81)	(0.72)
Med	1.658***	1.643***	1.612***	1.611***	3.007***	2.951***	2.964***	2.926***
	(4.31)	(4.28)	(4.15)	(4.16)	(4.03)	(3.96)	(3.95)	(3.95)
High	6.881***	6.901***	6.994***	6.962***	8.419***	8.228***	8.257***	8.266***
	(5.99)	(6.01)	(6.05)	(5.71)	(9.98)	(10.05)	(10.18)	(9.91)
Low × DispAnalyst	0.710	0.864	0.970	0.891	8.336	8.553	9.081	9.920
	(0.17)	(0.2)	(0.23)	(0.21)	(0.87)	(0.85)	(0.89)	(1.01)
Low × DispGap	0.457	0.459	0.469	0.465	1.214	1.176	1.240	1.054
	(1.51)	(1.5)	(1.52)	(1.49)	(1.53)	(1.48)	(1.54)	(1.33)
Med × DispAnalyst	3.595	3.394	3.576	3.544	6.343	5.763	6.125	6.347
	(1.52)	(1.47)	(1.53)	(1.51)	(0.98)	(0.9)	(0.95)	(1.02)
Med × DispGap	0.379*	0.395*	0.406*	0.402*	1.219*	1.217**	1.276**	1.197**
	(1.71)	(1.72)	(1.82)	(1.76)	(1.94)	(2.05)	(2.13)	(2.12)
High × DispAnalyst	10.140	9.974	9.821	9.495	15.676	14.320	14.525	14.484
	(1.56)	(1.54)	(1.51)	(1.38)	(0.96)	(0.9)	(0.9)	(0.87)
High × DispGap	1.290***	1.286***	1.248***	1.274***	2.195**	2.204**	2.266**	2.154**
	(3.77)	(3.79)	(3.72)	(3.74)	(2.29)	(2.43)	(2.47)	(2.35)
Spread		0.109*	0.119*	0.111*		0.319*	0.312*	0.321*
		(1.76)	(1.7)	(1.72)		(1.86)	(1.88)	(1.86)
Log (Stock Size)	0.157**	0.145**	-0.059	0.188***	0.025	-0.063	-0.056	-0.054
	(2.22)	(2.02)	(-0.56)	(2.77)	(0.22)	(-0.52)	(-0.44)	(-0.44)
Num_AnalystRec	-0.059*	-0.053*	-0.056*	-0.053*	-0.055	-0.018	-0.017	-0.020
	(-2.01)	(-1.71)	(-1.91)	(-1.76)	(-1.58)	(-0.39)	(-0.37)	(-0.45)
Log (Fund TNA)	0.014	0.013	-0.391***	0.014	0.021	0.015	0.014	0.015
	(0.88)	(0.81)	(-3.38)	(0.85)	(0.8)	(0.57)	(0.54)	(0.56)
Log (Fund Age)	-1.035***	-1.036***	-1.039***	-1.034***	-1.120***	-1.131***	-1.131***	-1.131***
	(-12.4)	(-12.39)	(-12.39)	(-12.44)	(-12.2)	(-12.36)	(-12.36)	(-12.42)
Fund Turnover	-0.052	-0.047	-0.054	0.471*	-0.142	-0.113	-0.114	-0.113
	(-0.85)	(-0.77)	(-0.86)	(1.76)	(-1.4)	(-1.08)	(-1.1)	(-1.1)
Log (Stock Size) * Log (Fund TNA)			0.043***				0.021	
			(3.37)				(1.11)	
Log (Stock Size) * Fund Turnover				-0.056**				-0.087
				(-2.26)				(-0.91)
Adj-Rsq	0.118	0.118	0.120	0.119	0.092	0.095	0.096	0.097
obs	77,548	77,547	77,547	77,547	77,548	77,547	77,547	77,547

Table A4: Robustness Checks on Dispersion of Opinion and the Convex Flow-Performance Sensitivity (*DispAnalyst* and *DispGap*)

Panel A presents the results of the following cross-sectional regressions, as well as their corresponding robust t-statistics,

$$FlowConvexity_f = \alpha_0 + \beta_1 \overline{DispAnalyst}_f + \beta_2 \overline{DispGap}_f + c\bar{M}_f + e_f,$$

where $FlowConvexity_f$ is the flow convexity of fund f, $\overline{DispAnalyst}_f$ and $\overline{DispGap}_f$ refer to the analyst dispersion and return gap dispersion computed over the entire sample period, and the vector $\bar{M}$ stacks the sample average of all control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Flow convexity is estimated for each fund over the entire sample period as follows: $FlowConvexity_f = Corr(Flow_{f,m}, Rank_{f,m-1}{}^2)$, in which $Flow_{f,m}$ is the monthly flow of fund f in month m, $Rank_{f,m-1}$ is the rank of style-adjusted fund returns, and the ranks are normalized to follow a [0, 1] uniform distribution. Panel B reports similar statistics when all variables, including flow convexity, dispersion proxies as well as other controls are further adjusted by netting out the style average. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Flow Convexity Regressed on Dispersion Proxies

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	-0.009	0.026	-0.015	-0.008	0.027	-0.013	-0.021	-0.013
	(-0.35)	(1.14)	(-0.55)	(-0.28)	(1.18)	(-0.48)	(-0.42)	(-0.41)
DispAnalyst	0.172***		0.160***	0.172***		0.160***	0.160***	0.160***
	(3.23)		(2.94)	(3.24)		(2.96)	(2.96)	(2.95)
DispGap		0.003**	0.003*		0.003**	0.003*	0.003*	0.003*
		(1.99)	(1.72)		(1.97)	(1.71)	(1.71)	(1.72)
Spread				0.001	0.001	0.001	0.001	0.001
				(0.54)	(0.33)	(0.46)	(0.46)	(0.46)
Log (Stock Size)	0.005	0.006	0.006	0.005	0.005	0.005	0.006	0.005
	(1.53)	(1.51)	(1.56)	(1.37)	(1.39)	(1.41)	(1.07)	(1.29)
Num_AnalystRec	-0.003**	-0.004***	-0.003*	-0.003*	-0.004**	-0.003*	-0.003*	-0.003*
	(-2.05)	(-2.67)	(-1.90)	(-1.88)	(-2.54)	(-1.76)	(-1.76)	(-1.76)
Log (Fund TNA)	0.011***	0.012***	0.012***	0.011***	0.012***	0.012***	0.013	0.012***
	(7.54)	(8.15)	(7.70)	(7.49)	(8.11)	(7.65)	(1.58)	(7.65)
Log (Fund Age)	-0.007*	-0.010**	-0.008**	-0.007*	-0.010***	-0.008**	-0.008**	-0.008**
	(-1.82)	(-2.56)	(-1.97)	(-1.85)	(-2.59)	(-1.99)	(-1.99)	(-1.99)
Fund Turnover	0.016***	0.015***	0.015***	0.016***	0.015***	0.015***	0.015***	0.015
	(4.66)	(4.16)	(4.10)	(4.67)	(4.16)	(4.11)	(4.11)	(0.72)
Log (Stock Size) × Log (Fund TNA)							-0.000	
							(-0.21)	
Log (Stock Size) × Fund Turnover								-0.000
								(-0.02)
Adj-Rsq	0.045	0.042	0.046	0.045	0.042	0.046	0.046	0.046
Obs	2,349	2,347	2,347	2,349	2,347	2,347	2,347	2,347

Panel B: Style-adjusted Flow Convexity Rank Regressed on Style-adjusted Dispersion Proxies

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	0.001	0.001	0.002	0.001	0.001	0.002	0.002	0.002
	(0.55)	(0.61)	(0.69)	(0.57)	(0.58)	(0.68)	(0.65)	(0.68)
DispAnalyst	0.156***		0.146***	0.156***		0.145***	0.146***	0.146***
	(2.90)		(2.67)	(2.91)		(2.67)	(2.68)	(2.67)
DispGap		0.004**	0.004**		0.004**	0.004**	0.004*	0.004**
		(2.12)	(1.99)		(2.12)	(1.98)	(1.94)	(1.97)
Spread				0.000	-0.000	-0.000	0.000	-0.000
				(0.19)	(-0.14)	(-0.01)	(0.02)	(-0.01)
Log (Stock Size)	-0.000	0.002	0.003	-0.001	0.002	0.003	0.003	0.003
	(-0.07)	(0.43)	(0.56)	(-0.10)	(0.44)	(0.55)	(0.60)	(0.55)
Num_AnalystRec	-0.003	-0.004**	-0.003*	-0.003	-0.004**	-0.003*	-0.003*	-0.003*
	(-1.63)	(-2.44)	(-1.76)	(-1.54)	(-2.40)	(-1.70)	(-1.69)	(-1.70)
Log (Fund TNA)	0.011***	0.012***	0.011***	0.011***	0.012***	0.011***	0.011***	0.011***
	(7.45)	(7.99)	(7.57)	(7.41)	(7.96)	(7.54)	(7.50)	(7.53)
Log (Fund Age)	-0.010**	-0.013***	-0.011***	-0.010**	-0.013***	-0.011***	-0.011***	-0.011***
	(-2.49)	(-3.31)	(-2.79)	(-2.50)	(-3.31)	(-2.79)	(-2.80)	(-2.79)
Fund Turnover	0.014***	0.012***	0.012***	0.014***	0.012***	0.012***	0.012***	0.012***
	(3.75)	(3.01)	(2.96)	(3.75)	(2.99)	(2.94)	(2.93)	(2.93)
Log (Stock Size) × Log (Fund TNA)							0.001	
							(0.54)	
Log (Stock Size) × Fund Turnover								-0.000
								(-0.02)
Adj-Rsq	0.040	0.037	0.042	0.040	0.037	0.042	0.042	0.042
Obs	2,349	2,347	2,347	2,349	2,347	2,347	2,347	2,347

Table A5: Robustness Checks on Dispersion of Opinion and Mutual Fund Fees (*DispPerf* and *DispShr*)

Models 1 to 4 present the results of the following quarterly Fama-MacBeth regressions, as well as their corresponding Newey-West adjusted t-statistics,

$$Fee_{f,t} = \alpha_0 + \beta_1 Disp_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Fee_{f,t}$ refers to the annualized percentage fee (expense ratio) of fund f in quarter t, $Disp_{f,t-1}$ refers to dispersion of opinion proxy, and the vector M stacks all other control variables, including the bid-ask spread, log(stock size), number of analyst, log(fund TNA), log(fund age), and fund turnover ratio. Models 5 to 8 report similar regression parameters when fund fees, dispersion proxies as well as other controls are further adjusted by netting out their style average. In Panels A and B, $Disp_{f,t-1}$ refers to dispersion proxy $DispPerf_{f,t-1}$ and $DispShr_{f,t-1}$ (the Internet Appendix provides the details). Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Out-of-sample Fees (in %) Regressed on Performance Dispersion

	Fees				Style-adjusted Fees			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	1.627***	1.634***	1.701***	1.652***	-0.020***	-0.020***	-0.022***	-0.020***
	(51.56)	(48.81)	(47.7)	(41.46)	(-4.82)	(-4.80)	(-5.36)	(-4.81)
DispPerf	0.084***	0.083***	0.083***	0.083***	0.080***	0.080***	0.079***	0.080***
	(8.05)	(7.92)	(7.93)	(7.92)	(7.86)	(7.77)	(7.77)	(7.76)
Spread		-0.009	-0.009	-0.009		-0.006	-0.006	-0.006
		(-0.70)	(-0.74)	(-0.74)		(-0.36)	(-0.34)	(-0.36)
Log (Stock Size)	-0.030***	-0.029***	-0.036***	-0.031***	-0.044***	-0.045***	-0.041***	-0.044***
	(-10.21)	(-10.53)	(-11.40)	(-8.72)	(-7.47)	(-7.71)	(-7.07)	(-7.43)
Num_AnalystRec	0.004*	0.003*	0.003*	0.003*	0.006**	0.006**	0.006**	0.006**
	(1.97)	(1.72)	(1.69)	(1.74)	(2.61)	(2.51)	(2.46)	(2.44)
Log (Fund TNA)	-0.074***	-0.074***	-0.087***	-0.074***	-0.074***	-0.074***	-0.074***	-0.074***
	(-17.26)	(-17.03)	(-14.59)	(-17.14)	(-16.24)	(-16.09)	(-16.04)	(-16.16)
Log (Fund Age)	0.011	0.011	0.011	0.011	0.014	0.013	0.013	0.013
	(1.11)	(1.07)	(1.06)	(1.08)	(1.22)	(1.17)	(1.12)	(1.18)
Fund Turnover	0.083***	0.082***	0.082***	0.061***	0.081***	0.081***	0.080***	0.080***
	(16.19)	(16.66)	(16.53)	(3.88)	(15.88)	(16.39)	(16.12)	(15.25)
Log (Stock Size) × Log (Fund TNA)			0.001***				0.009***	
			(4.01)				(6.31)	
Log (Stock Size) × Fund Turnover				0.002				-0.002
				(1.14)				(-0.46)
Adj-Rsq	0.209	0.210	0.209	0.209	0.189	0.189	0.190	0.190
Obs	80,244	80,194	80,194	80,194	80,244	80,194	80,194	80,194

Panel B: Out-of-sample Fees (in %) Regressed on Number of Share Classes

	Fees				Style-adjusted Fees			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Intercept	1.741***	1.759***	1.784***	1.769***	-0.020***	-0.018***	-0.021***	-0.019***
	(58.98)	(62.35)	(51.26)	(41.82)	(-4.64)	(-4.34)	(-5.02)	(-4.40)
DispShr	0.084***	0.085***	0.085***	0.085***	0.087***	0.087***	0.087***	0.088***
	(7.31)	(7.30)	(7.28)	(7.26)	(7.64)	(7.71)	(7.69)	(7.69)
Spread		0.006	0.006	0.006		0.007	0.007	0.007
		(0.38)	(0.35)	(0.36)		(0.35)	(0.37)	(0.34)
Log (Stock Size)	-0.039***	-0.041***	-0.044***	-0.042***	-0.065***	-0.068***	-0.064***	-0.068***
	(-10.23)	(-11.5)	(-12.21)	(-8.15)	(-7.77)	(-8.18)	(-7.54)	(-8.07)
Num_AnalystRec	0.002	0.002	0.002	0.002	0.003	0.004	0.003	0.004
	(0.94)	(1.16)	(1.11)	(1.19)	(1.07)	(1.36)	(1.30)	(1.35)
Log (Fund TNA)	-0.103***	-0.103***	-0.109***	-0.103***	-0.102***	-0.102***	-0.102***	-0.102***
	(-40.47)	(-40.43)	(-21.31)	(-40.78)	(-39.06)	(-38.57)	(-38.57)	(-38.82)
Log (Fund Age)	0.030***	0.029***	0.029***	0.029***	0.035***	0.034***	0.033***	0.033***
	(3.63)	(3.52)	(3.52)	(3.56)	(3.75)	(3.66)	(3.58)	(3.67)
Fund Turnover	0.083***	0.083***	0.083***	0.072***	0.079***	0.079***	0.078***	0.078***
	(14.03)	(14.49)	(14.47)	(3.69)	(13.88)	(14.40)	(14.11)	(13.33)
Log (Stock Size) × Log (Fund TNA)			0.001				0.010***	
			(1.32)				(7.12)	
Log (Stock Size) × Fund Turnover				0.001				-0.005
				(0.50)				(-1.20)
Adj-Rsq	0.246	0.247	0.247	0.247	0.236	0.237	0.238	0.237
Obs	80,244	80,194	80,194	80,194	80,244	80,194	80,194	80,194

Table A6: Robustness Checks on the Fee and (Gross-of-Fee) Performance Relationship (*DispPerf* and *DispShr*)

This table presents the results of the following quarterly regressions with or without dispersion of opinion,

$$Fee_{f,t} = \alpha_0 + \beta_1 \hat{\alpha}_{f,t-1} + \beta_2 Disp_{f,t-1} + \beta_3 \hat{\alpha}_{f,t-1} \times Disp_{f,t-1} + \beta_4 MktInef_{f,t-1} + \beta_5 \hat{\alpha}_{f,t-1} \times MktInef_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

$$Fee_{f,t} = \alpha_0 + \gamma_1 \hat{\alpha}_{f,t-1} + \gamma_2 MktInef_{f,t-1} + cM_{f,t-1} + e_{f,t},$$

where $Fee_{f,t}$ is the annualized percentage fee (expense ratio) of fund f in quarter t, $\hat{\alpha}_{f,t-1}$ is the average monthly gross-of-fee alpha of fund f in quarter $t-1$, $Disp_{f,t-1}$ refers to the two proxies for dispersion of opinions of fund skills $DispPerf_{f,t-1}$ and $DispShr_{f,t-1}$ (the Internet Appendix provides the details), $MktInef_{f,t-1}$ refers to bid-ask spread, variance ratio and market delay, and the vector M stacks all the other control variables, including log(stock size), number of analyst, log(fund TNA), log(fund age), fund turnover ratio. Gross-of-fee alpha is estimated using Fama-French-Carhart four-factor model with a five-year estimation period. Panel A reports the regression parameters and their clustered (by time, following Gil-Bazo and Ruiz-Verdú, 2009) or Newey-West adjusted t-statistics over the sample period from 1991 to 2010. Panel B reports similar statistics when fund fees and other variables are adjusted by netting out their style average. In Panel C, no-load funds are defined as those charging no front- or back-end loads. Fees for load funds are defined as the annual expense ratio plus the front-end loads divided by the assumed holding period in years. Panel D reports the Fama-MacBeth regression parameters and their Newey-West adjusted t-statistics over the later period from 2001 to 2010. All the pooled OLS regressions include time dummies for quarters. Index and institutional funds are excluded from the analysis. The numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Out-of-sample Fees (in %) Regressed on Four-factor Adjusted Gross-of-Fee Return and Dispersion Proxies									
Sample of Funds	Regression and Standard Errors	Market Inefficiency	Without Dispersion	Regressions with Dispersion in Opinions					
			Alpha	Alpha	DispPerf	Alpha × DispPerf	Alpha	DispShr	Alpha × DispShr
Panel A: Regressions Using Different Standard Errors and Alternative Market Inefficiency Measures (1991–2010)									
Full Sample	FM, Newey-West	Spread	-0.011**	0.004	0.075***	-0.006	-0.005	0.146***	-0.020
			(-2.24)	(0.32)	(6.66)	(-1.06)	(-0.21)	(5.42)	(-1.01)
Full Sample	FM, Newey-West	|VR-1|, Delay	-0.011**	-0.004	0.079***	-0.005	-0.004	0.148***	-0.021
			(-2.25)	(-0.28)	(7.41)	(-0.76)	(-0.18)	(5.28)	(-1.16)
Full Sample	OLS, Clustered by Time	Spread	-0.007*	-0.015**	0.056***	0.001	-0.025***	0.063***	0.003
			(-1.81)	(-2.07)	(8.04)	(0.53)	(-4.06)	(24.96)	(1.17)
Panel B: Style-Adjusted Fees Regressed on Alphas (1991–2010)									
Full Sample	FM, Newey-West	Spread	-0.010**	0.013	0.063***	-0.010	0.001	0.138***	-0.024
			(-2.15)	(1.13)	(6.05)	(-1.59)	(0.05)	(6.27)	(-1.18)
Full Sample	FM, Newey-West	|VR-1|, Delay	-0.010**	0.004	0.066***	-0.008	0.004	0.141***	-0.025
			(-2.19)	(0.28)	(6.53)	(-1.23)	(0.17)	(6.08)	(-1.33)
Panel C: Sub-Sample of Funds (1991–2010)									
No-load Funds	FM, Newey-West	Spread	-0.018**	0.021	0.091***	-0.003	0.004	-0.008	-0.007
			(-2.09)	(0.54)	(6.63)	(-0.24)	(0.15)	(-0.3)	(-0.54)
Load Funds	FM, Newey-West	Spread	-0.044**	0.023	0.095***	-0.003	0.028	0.149***	-0.027
(2-year holding period)			(-2.06)	(0.93)	(4.36)	(-0.27)	(0.51)	(3.49)	(-1.01)
Load Funds	FM, Newey-West	Spread	-0.031**	0.020	0.099***	-0.004	0.027	0.134***	-0.034
(7-year holding period)			(-2.59)	(1.05)	(4.95)	(-0.46)	(0.62)	(10.49)	(-1.29)
Deciles 3−10	FM, Newey-West	Spread	-0.012**	-0.012	0.046***	-0.002	-0.010	0.148***	-0.015
(Exclude small funds)			(-2.18)	(-0.83)	(5.66)	(-0.32)	(-0.43)	(5.42)	(-0.85)
Panel D: Robustness Checks on Later Periods (2001–2010)									
Full Sample	FM, Newey-West	Spread	-0.013**	0.015	0.089***	-0.015*	-0.036***	0.066***	0.006
			(-2.22)	(1.06)	(6.66)	(-1.77)	(-3.66)	(9.44)	(1.61)
Full Sample	FM, Newey-West	|VR-1|, Delay	-0.014**	0.011	0.087***	-0.012	-0.025	0.066***	0.005
			(-2.35)	(0.55)	(6.91)	(-1.42)	(-1.41)	(9.50)	(1.43)