Compensation and Managerial Herding: Evidence from the Mutual Fund Industry

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Abstract

We test the corporate theory of managerial herding based on reputation and career concerns (Scharfstein and Stein, 1990) by focusing on the mutual fund industry. We investigate the trade-off between reputation and compensation and study how incentives in the advisory contract affect managerial herding and risk taking. We consider two types of herding: category herding – the choice of operating in a category in which it is easier to preserve reputation, and stock herding – the choice of a trading strategy similar to the ones of the competitors. We show that a high incentive contract induces entry in categories in which an extreme performance realization is more likely, the adoption of trading strategies different from the ones being followed by other funds and higher risk taking. Family affiliation reduces (increases) the tendency to herd (to take risk) and, therefore, reduces the need for high incentive contracts. Moreover, unobserved actions of mutual funds with high incentive contracts induce managers to take performance-enhancing unobserved actions.

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The corporate literature has argued that managers, uncertain about their own ability and concerned about their reputation in the labor market, have a natural tendency to herd. Even though herding is inefficient from a social standpoint, it can be rational from the perspective of the managers. Scharfstein and Stein (1990) and Zwiebel (1995) show that managers have an incentive to herd in order to minimize the negative consequences of underperformance on their reputation. "If an investment manager and her employer are uncertain of the manager's ability to pick the right stocks, conformity with other investment professionals preserves the fog – i.e., the uncertainty regarding the ability of the manager to manage the portfolio" (Scharfstein and Stein, 1990).

The natural tendency to herd can be contrasted by some countervailing forces, one of which is compensation ("profits"). "Managers who care only about their reputation will always herd...but managers who care about profits will have to trade off the loss of reputation against profits...Put differently, as the weight on profits increases, the range of parameter values over which there is herd behavior shrinks" (Scharfstein and Stein, 1990).

This trade-off between reputation and compensation and its impact on managerial behavior have not been directly empirically tested. The goal of this paper is to bridge this gap. Using information from the NSAR form filings by mutual funds, we test how managerial behavior (herding as well as risk taking) is affected by the incentives in the compensation structure as defined in the advisory contract. The mutual fund industry provides an ideal test setting as it allows us to observe on a regular basis managers' actions and incentives as well as many of the other factors that may affect managerial choice.

Reputation plays a major role in the mutual fund industry and a more incentive-loaded compensation structure that puts relatively more weight on performance may offset the negative effects of a loss of reputation. Therefore, in line with the theory on managerial herding, we expect to see less herding and more risk taking in the presence of a more incentive-loaded compensation structure.

Also, most mutual funds are part of bigger entities ("families"). This affects the trade-off between reputation concerns and incentives. Family affiliation, by providing access to better information and cheaper trading facilities (Chen *et al.*, 2004), affects the ability of the fund manager and therefore, his incentive to herd/take risk. Inasmuch as economies of scale either in information or in managing costs exist and are a function of the size of the family, we expect herding to be negatively affected by family affiliation and risk taking to be positively related to it. This effect is further reinforced by family strategies aimed at generating star funds by inducing some of the managed funds to take more risk (Nanda *et. al.*, 2004).

We test these hypotheses on the US mutual funds for the period 1994-2003. We consider two types of herding: "category herding" – the choice of operating in a category in which it is easier to preserve reputation, and "stock herding" – the choice of a trading strategy similar to the ones of the competitors. First, we study how the type of compensation and family affiliation of the fund is related to the choice of operating in certain categories. We define categories in terms of their "herding conduciveness", that is the ease with which, for the same amount of risk taken, a herding strategy can be implemented as opposed to a risk-taking one. We use the number of existing funds in a category as a proxy for herding-conduciveness of the category. The higher the number of funds, the more difficult it is to achieve an extreme performance realization (i.e., to rank either top or bottom) and the easier it is to herd.

We quantify the contractual incentives by separately identifying the average compensation rate and the incentive part and show that they negatively affect the choice to enter a more herding conducive category. The economic significances of the results are quite striking. One standard deviation increase in the incentives[1] that the investors are ready to pay leads to a reduction in the probability of operating in one of the three largest categories from 0.2476 to 0.1412, i.e. a decrease in probability of 0.1064. On the other hand, the probability of operating in one of the three smallest categories increases from 0.0158 to 0.0401. Also, family affiliation reduces category herding with the economic impact being the same order of magnitude as the impact of incentives.

Next, we focus on stock herding and risk taking and we study their relation to contractual incentives. We show that contractual incentives reduce stock herding and increase risk taking. The effect of an increase in the incentive is highly significant - a one standard deviation increase in the incentives reduces the stock herding measure by at least 0.84 standard deviation (depending on the incentives measure we adopt) and increases risk taking by at least 0.28 standard deviation. Moreover, funds that belong to larger families herd less in their stock trading and take more risk. An increase in the size of the family by one standard deviation reduces the incentive to stock herd by 0.70 standard deviation and increases risk taking by about 0.30 standard deviation.

Higher incentives can potentially lead to higher performance through increased effort on the part of the manager, since his payoff is more closely related to his performance. At the same time, a high incentive contract also has the additional effect of inducing the manager to take on more risk. What it is less clear, however, is the net effect. Indeed, if any extra performance just compensates for the additional risk, high incentives are not

[1] Measured in terms of Coles' Incentive Rate, defined later in the text.

beneficial to the principal. In fact, it has actually been argued that a higher incentive leads to excessive risk-taking by the manager per unit of performance delivered.

Incentives also increase managerial effort as demonstrated by the positive relationship between risk-adjusted return and incentives. The economic significance of the result is quite striking. The portfolio of funds with the highest incentive quintile outperforms the portfolio of funds with the lowest incentive quintile by 23 basis points per month in terms of raw return and 22 basis points per month in terms of risk-adjusted return over our sample period. On the other hand, one standard deviation increase in the incentives[2] that the investors are ready to pay leads to an increase in annual volatility of monthly fund returns by 14.67%.

Moreover, incentives, by affecting performance and risk taking, also modify the survival probability of the fund. After controlling for prior year risk and risk-adjusted return, higher incentive funds have higher hazard rate and lower probability of survival. In economic terms, a one percentage increase in the incentives raises the hazard rate by 8.46%. Equivalently, a one percentage increase in incentives leads to a reduction in the survival probability of 2%.

What are the implications for the investors? If the incentives increase the efforts of the managers, this should translate into a higher net-of-risk performance. If, however, higher incentives simply induces higher risk taking, we should not expect to observe superior performance once we properly control for risk. Instead, due to the increased risk, incentives would lead to lower probabilities of survival for the funds. Nor should we expect performance to persist over time. We claim that the increase in performance cannot be explained just by higher risk-taking, but that it is related to an increase in the effort of the manager that makes performance persistent over time. And indeed, we show that funds with high incentive compensation contracts deliver higher performance net-of-risk and that this performance persists over the following year.

Multivariate regressions show that the persistence of outperforming funds increases with the level of incentives. The economic significance is sizable. One percentage increase in the incentives raises the probability that a high performing fund (a winner) is also among the high performing funds in the following year by 4.33%. That is, the higher the incentives, the more the winners repeat themselves. Also, by using a standard persistence test setting similar to Carhart (1997), we provide evidence that, among the funds with the highest incentives, not only the performance of the lower funds persist, but also those of the winners. That is, the best performing funds of the prior year have a positive alpha of 41 basis points

[2] Measured in terms of Coles' Incentive Rate, defined later in the text.

per month in the following year. No analogous result exists for the low incentive funds. In fact, the difference in performance among the best performing funds of the prior year, separated into high and low incentives, is a significant 71 basis points per month in the following year. Moreover, even after controlling for survival, the difference in risk-adjusted performance between the portfolio of funds with the highest incentive quintile and the portfolio of funds with the lowest incentive quintile remains robust.

To investigate the channel through which incentives affect performance, we study a measure of the "unobserved actions" of the fund managers. Based on the funds' holdings, this measure captures the difference between the gross return of the fund and the return of a buy-and-hold strategy based on the observable portfolio of the fund - termed as the "return gap" (Kacperczyk *et al.*, 2005). Higher incentives improve performance by increasing the net-of-risk return gap. In particular, the risk-adjusted return gap of the portfolio of high incentive funds is 13 basis points per month more than the portfolio of low incentive funds. However, there is no significant difference in the returns from a buy-and-hold strategy based on the disclosed portfolio of the funds. This suggests that investors can not earn superior returns by mimicking the disclosed portfolios of the high incentive funds, which is public information. Most of the superior performances are related to the dynamic rebalancing of the portfolio by the managers of the funds with high incentive contracts.

These findings provide a direct support to the predictions of the theory on managerial behavior (Scharfstein and Stein, 1990, Zwiebel, 1995). They also make several contributions to the existing literature. First, they provide evidence on different dimensions of herding in the mutual fund industry, showing how the choice of the category itself represents a new and hitherto undocumented dimension of herding. This helps shed some light on the rationale for the clustering of mutual funds in relatively few categories.

Second, our results quantify the role played by the type of compensation in the mutual fund industry. The incentive structure of the compensation contract directly affects both herding and risk taking. This has important policy implications for the investors as well as the market as a whole. Indeed, most of the recent debate on mutual funds has concentrated on the cost for the investors of high compensation and greater incentives. Few have however focused on the benefits of higher incentive compensation. That is, the benefits associated with high incentive compensation in terms of lower herding have gone largely unnoticed.

Moreover, the fact that a change in compensation can directly affect herding and risk taking has important implications in terms of the recent debate on mutual fund fees and managers' compensation in the US. "Some observers express concern that herding by market participants exacerbates volatility, destabilizes markets, and increases the fragility of the financial system" (Bikhchandani and Sharma, 2001). If herding, driven by reputation and career concerns, exacerbates market fluctuations and generates bubble-type effects, higher compensation may increase market stability by reducing herding. However, if herding is information-motivated and accelerates the price adjustment process at the individual stock level (Wermers, 1999, Chen *et al.*, 2001), then high incentive compensation structure of mutual fund managers may not in fact have an affect on market stability.

Fourth, our findings also show the role played by family affiliation on herding and compensation setting. Recent evidences have started to deal with the implications of the family structure of the mutual fund industry. The stress has always been put on pathologies such as late trading (Zitzewitz, 2004) and favoritism (Guedj and Papastakaikoudi, 2004, Gaspar *et al.,* 2004). This paper shows another important aspect of family affiliation: families, by providing managers with ways of performing better through cross-fund support and/or by smoothing the effects of worse performance (e.g., by reducing the employment risk through job rotation within the family) induce their managers to herd less. This has direct externalities not only for the investors in the fund, but for the financial markets overall.

Finally, we contribute to the debate on executive compensation. There is a wide body of literature starting with Jensen and Murphy (1990) about the optimal incentive structure in the compensation of managers. The mutual fund industry provides a unique opportunity to study such an issue in a context in which it is possible to directly observe the action of the managers (category and stock herding) as well as instrument for the principal (i.e., investor) side of the market. The intuitions from the mutual fund setting can be extended to the more general situation of corporate managers operating in the presence of information asymmetry about their ability. An obvious example would be the bio-tech industry or other high R&D-intensive industries. Also, they would apply to industries characterized by intense competition, in which the compensation of the manager is related to the performance of the managers of the other firms competing in the same industry and manager's compensation increases with out-performance relative to the rival firms.

We relate to different strands of literature. The first deals with herding. A comprehensive survey about herding is provided by Bikhchandani and Sharma (2001). Scharfstein and Stein (1990) and Zwiebel (1995) model the incentives for the managers to herd with their peers to preserve their reputation in the labor market in the presence of information asymmetry. Grinblatt *et al.* (1995) and Wermers (1999) document herding among mutual fund managers and Lakonishok *et al.* (1992) document herding among pension funds.

The second strand of literature deals with the way incentives affect managerial behavior. Jensen and Meckling (1976) and the corporate finance literature that followed show that value-maximizing levered equity holders will prefer more asset volatility, even at the expense of firm value. Grinblatt and Titman (1989) show that a fund manager who can hedge his incentive fee will try to maximize the value of the fee by increasing fund leverage as much as possible. More recently the focus has shifted to the relation between incentives and risk. For example, Guay (1999) shows that, in the case of risk-averse managers, the convexity of the payoff structure may be offset by the concavity of the utility function. Ju, Leland, and Senbet (2002), show that the degree of risk taking induced by an option-type contract is a function of the degree of managerial risk aversion and the underlying investment technology. Ross (2004) shows that that there is no type of incentive scheme that can make all expected utility maximizers more willing to take on more risk. We contribute to this literature by providing evidence that more incentive loaded contracts do indeed increase both performance and risk taking.

The third strand of literature is related to mutual fund performance and its persistence. Lehman and Modest (1987), Hendricks, Patel and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995) show evidences of short-term persistence in the performance of mutual funds. Carhart (1997), Daniel, Grinblatt, Titman and Wermers (1997), Wermers (2000) explain most of this persistence with risk factors, i.e., momentum; and expenses – but not with managerial ability. This literature agrees on the fact that either performance does not persist or that only poorly performing funds do actually persist. Our paper presents first evidence that, conditional on incentives, outperformance of the best funds from one year continue to persist for the following year.

The fourth strand of literature is related to the economics of mutual fund families. Nanda *et al.* (2004) show the positive spillover that having a 'star' fund provides to all the funds belonging to the same family and the strategies played by the families to generate star funds. Massa (2003) links industry structure to fund behavior and explains part of fund performance in terms of the family strategy of fund proliferation and product differentiation. Khorana and Servaes (1999) study the determinants of mutual fund starts, showing the factors that induce families to set up new funds. Mamaysky and Spiegel (2001) provide a first equilibrium model of the mutual fund industry, arguing that families generate funds to allow investors to overcome their hedging needs. More recently, Guedj and Papastaikoudi (2004) show that performance persists at the family level, especially large fund families, suggesting that families purposefully allocate resources across funds in an unequal way, while Gaspar *et al.* (2004) provide evidence of cross-fund subsidization at the family level.

The fifth strand of literature studies the characteristics of the advisory contracts in the mutual fund industry. Deli (2002) uses the NSAR filings to look at differences in advisory contracts offered to mutual funds and finds two types of contracts prevalent in the mutual fund industry - linear contracts and concave contracts. Differences in compensation are attributed to the differences in marginal product offered by the managers, differences in monitoring performance and scale economies. Using the NSAR filings, Kuhnen (2004) and Warner and Wu (2004) analyze the impact of changes in the contract. Though the absolute number of contract change is very small, it is shown that such changes benefit the investors. Lemmon *et al.* (2000) studies the contractual incentives of a sample of dual-purpose funds and the impact of incentives on the behavior of the funds' managers. In a similar vain, Almazan *et al.* (2004) look at the constraints imposed on mutual fund managers in terms of trading restrictions. They show that funds belonging to larger families have lower level of restrictions.

The paper is structured as follows. In Section I, we lay out the testable restrictions and describe the estimation methodologies. Section II describes the data and the construction of the variables. Section III reports the main results. A brief conclusion follows.

I. Test lay-out

A. Hypotheses

We start with the main distinguishing features of the mutual fund industry to see how they would fit within the theoretical framework provided by Scharfstein and Stein (1990). We focus on five features. First, managerial performance contains "systematically unpredictable components of investment value" and fund managers care about reputation. Each fund manager has his own track record that depends on the quality of his past performance and that allows the manager to market himself should he decide to leave the company. Essentially, a manager's track record is the most important signal about his ability in the managerial labor market. Second, funds operate in different categories and managers are evaluated with respect to the other fund managers competing in the same category. Third, compensation is primarily related to the amount of assets under management. Fourth, the relation between new investor flow and performance is non-linear: outperforming funds receive a disproportionately high amount of inflows. Fifth, mutual funds in general are structured in large groups ("family") in which the same advisory company manages the portfolios of many funds.

The first characteristic suggests the existence of reputation concerns. It implies that "managers will be more favorably evaluated if they follow the decisions of others than if they behave in a contrarian fashion. Thus "an unprofitable decision is not as bad for reputation when others make the same mistake. They can share blame if there are systematically unpredictable shocks" (Scharfstein and Stein, 1990). This induces herding. Evidence of fund herding has already been documented in the literature (Grinblatt *et al.,* 1995; Wermers, 1999). The existence of reputation concerns would also be consistent with the findings on managers taking more risk when lagging behind their competitors in terms of minimizing the chance of ranking at the bottom (Brown *et al.*, 1996 and Chevalier and Ellison, 1997).

The second characteristic – i.e., the segmentation in different categories – has implications in terms of herding/risk taking as the effectiveness of a herding strategy depends on the number of competing funds. As the number of funds increases, *for equal amount of risk taken*, the probability of an extreme realization (i.e., ranking at the top/bottom) gets more limited. For example, let us consider two categories: A and B. Category A is made of 2 funds, while category B is made of 100 funds. If performance is normally distributed and fund managers are not aware of their ability (Scharfstein and Stein, 1990), a fund manager will perceive to have 50% chance of ranking first/last in category A and only 1% chance of being at the top/bottom in category B. That is, in crowded categories it is easier to avoid extreme performance realizations. Therefore, more (less) crowded categories should be preferred by managers inclined to herd (take risk).

The third characteristic defines the compensation structure prevalent in the mutual fund industry in the US. The fee paid to the fund manager is a function of the assets under management. The compensation structure provides explicit incentives for the fund manager to outperform since outperformance leads to new inflows. An increase in the explicit incentives may offset the negative effects of a loss of reputation, reducing "the range of parameter values over which there is herd behavior" (Scharfstein and Stein, 1990). Moreover, the fourth characteristic – convexity in flow-performance relationship in the cross-section – which has been well documented in the literature (Chevalier and Ellison, 1997, Sirri and Tufano, 1998) creates additional incentives to outperform the competitors. Therefore, in line with the theory on managerial herding, we expect to see less herding and more risk taking in the presence of a more incentive-loaded compensation structure.

These first four characteristics describe a trade-off between reputation concerns and compensation that is analogous to the one modeled by Scharfstein and Stein (1990). The intuition is that without an incentive, the manager will rather preserve his reputation through herding. If, however, the incentives embedded in the compensation structure are high enough to offset the negative effects of a loss of reputation, the manager will refrain from herding. That is, the more incentive-loaded the compensation structure is, the more the financial concerns will outweigh the reputation concerns.[3]

The fifth characteristic – family affiliation – strongly affects the trade-off between reputation concerns and compensation. Indeed, the family provides the managers with more resources to collect and process information, lower transaction costs and better and more efficient trading facilities. The economies of scale either in information costs or in managing costs are related to the size of the family. This makes managers belonging to a big family better equipped to face competition and therefore less willing to herd.

At the same time, a family, in order to maximize overall profits, has the incentive to produce "star" funds by reducing herding among the managers affiliated to it (Nanda *et al.*, 2004). The family has different ways of inducing managers to reduce herding. On the one hand, it may use its bargaining power to induce the fund managers to follow different strategies. On the other hand, the family may reduce managers' exposure to reputation risk by, for example, supporting them in bad times, playing cross-fund support strategies, allowing them to rotate within the family in case their fund is closed down. Moreover, families are able to screen managers, potentially selecting the better ones that are less liable to herd. We therefore expect herding (risk taking) to be negatively (positively) affected by the fact that a fund is affiliated with a large family.

On the basis of these considerations, we can lay-out our tests of the trade-off between incentives and both herding and risk taking. We first define herding. There are two dimensions of herding: managers may herd by choosing to operate in a category in which many other funds are already operating (i.e., category herding) or by trading in line with the competitors (i.e., stock herding). That is, we expect managers who want to minimize their reputation concerns to prefer more herding conducive categories and to invest in the same stocks as the other funds in the same category.

In the mutual fund industry advisory contracts are very rarely changed (Kuhnen, 2004, Warner and Wu, 2004). This implies that contracts and choice of categories are simultaneously determined: managers consider the characteristics of the category and the contracts they are offered to operate there. Investors offer contracts conditional on the characteristics of the category chosen by the manager. Once the category/contract has been selected, managers choose how much they herd in their trading strategies. This allows us to posit the four first hypothesis:

H1 Incentives reduce category and stock herding.

[3] If the incentives in the compensation are high enough, the managers behave as in a standard winner-takes-all contest, increasing risk taking in order to maximize the probability of ranking top.

Incentives, by increasing risk, also increase the possibility that the fund underperforms so much as to be induced to liquidate. This reduces the fund probability of survival.

H2: *The more incentive-loaded the contract is, the lower is the survival probability of the fund.*

What is the net effect? If higher incentives just increase risk taking, there should not be a relation between performance and incentives net of risk. Higher performance would be mostly driven by higher risk taking and it would not persist over time. If, however, incentives improve management, for example increasing the collection of information, there should be a positive relation between performance and incentives, even after controlling for risk and survival. Moreover, conditioning on incentives, performance would persist.

H3 If incentives increase managerial effort, funds with more incentive-loaded contracts should have a higher and persistent net of risk performance.

Before proceeding, we discuss an important methodological issue

B. Methodology

We study if the type of compensation affects the managerial attitude towards risk. That is, we want to know whether a change in the compensation structure that makes the incentive to outperform more powerful causes a change in the incentive to herd/take risk. One issue is the potential endogeneity of the contract at the moment of the choice of the category.

The endogeneity arises from the fact that the contractual choice is jointly simultaneously determined with the choice of the category. Indeed, the contract may be considered as the outcome of a bargaining process between the advisory company and the fund investors. Moreover, the contractual choice may also be endogenous with respect to the stock herding/risk taking decisions.

To control for endogeneity, we adopt a two-stage instrumental variable procedure. This relies on some identifying variables that affect the type of contract but are not related to managerial behavior in terms of herding and risk taking. Since contracts are the outcome of a bargaining between the managing company and the investors of the fund, some characteristics of the investors would be a good identifying restriction. One of them is the size of the amount invested with the fund (*average account size*). We expect that the bigger the amount invested, the more the investor will have an incentive to monitor and will be able to impose a contract more suited to his own interests. This contract is likely to be structured in a way that produces the highest incentives per dollar amount of compensation.

The level of the overall expense for the investors (*expense ratio*) should also be related to the incentive part of the contract. Indeed, the investors may find it optimal to structure the contract so that the incentive part is negatively related to the overall expense. This would make the incentives even more powerful as the manager will have to take more risk and herd less to guarantee himself the same compensation. In this case, we expect a negative correlation between incentives and expense ratio.[4] While we employ these two instruments in our main tests reported later in the paper, as a robustness check, we also confirm our results using the average account size as the only instrument.

In order to control for fund specific characteristics, we include as additional control variables the size of the fund defined in terms of the assets under management (*ln(Fund TNA)*), its age since the fund began trading (*Age*), its dollar inflows (*New Money Inflow*), turnover of the fund (*Turnover*), return (*Fund Return*) and volatility (*Fund Return Volatility*), the level of its advertising and marketing fees (*12b-1 Expense*), the fund minimum investment requirement and a set of dummies for whether the fund charges performance fees (*Performance Based Fee*), and if a component of the fees is determined as a function of the performance of the rival funds (*Fee on Rival Performance*).

We use the number of funds in the category as the proxy for the degree of herding conduciveness of a category (H_C). We rank the categories annually based on the number of funds in increasing order. As a proxy for risk taking, we follow the existing literature and use both the yearly fund return volatility and the change in volatility of monthly fund returns in the last six months of the calendar year with respect to the first six months. We define the size of the family both in terms of the number of funds that it manages and in terms of the total net assets it manages.

II. Data and Construction of the Main Variables

The data come from three sources: NSAR-B filings from SEC Edgar database, CRSP Mutual Fund Monthly database and CDA/Spectrum Mutual Fund Holdings database. Mutual funds and other regulated investment management companies are required to file two NSAR forms annually. NSAR-A covers the first six months of the fiscal year for the particular investment management company, while NSAR-B covers the full year. NSAR forms have detailed information about contractual arrangement between the investors of the fund and the advisors (i.e. the managers). In this paper, we only look at NSAR-B filings for the

[4] It is worth to note that this variable accounts for the other expenses of the funds (postage, transaction, etc.) as well as the remuneration for the manager. What matters is the overall level of expense. We get similar results by using only the expense net of the remuneration part. These results are available upon request from the authors.

period starting from 1994 till 2003. Apart from compensation contracts, we also collect information about dollar inflows, turnover, expenses and other relevant variables.

Our sample period includes 92,260 NSAR-B filings. This dataset is then matched by fund name with CRSP Mutual Fund Monthly database. Since CRSP reports data for each class within a single fund separately, we first combine the information from different classes of the same fund, weighted by the total net assets of the class. We take observations only if the fund existed in the CRSP database in the same calendar year as the report date of NSAR-B filing. We also remove index funds and closed-end funds from our sample. The matching procedure yields 26,539 filings for 8,443 funds.

Finally, this dataset is matched with the CDA/Spectrum Mutual Fund Holdings database (Wermers, 2000). This database merges information about individual funds and the quarterly stock holdings of each fund. Appendix A provides a detailed description of the merge of the datasets and of the construction of the data. Using this link, we can match our NSAR/CRSP database with CDA/Spectrum database, which yields our final dataset. It includes information about compensation contracts, returns, categories and stock holdings of the funds, among others. The variables are defined in Appendix B and their summary statistics are presented in Table 1.

A. Incentive variables

We look at two aspects of the compensation contract that exists between the manager and the investors: the shape and the slope. We use information on the fund advisory contract and build on the extensive literature that has studied advisory compensation and used it as a proxy for the actual incentives received by the fund managers (Coles *et al.*, 2000, Deli, 2002, Deli and Varma, 2002, Kuhnen, 2004, and Warner and Wu, 2004). For the shape of the contract – the one that better defines the contractual incentives and the main focus of our subsequent analyses – we follow the above literature in calculating the incentives.

Mutual funds have either a linear contract that pays the manager a fixed percentage of assets under management, or a concave contract, that pays the manager progressively less as the assets under management increases. This is consistent with the evidence provided by Deli (2002), Warner and Wu (2004) among others. As is typical in the literature, about two-thirds of our sample funds have a linear contract and one-third have a concave contract.

Deli (2002) uses a measure of concavity developed by Coles *et al.* (2000) that accounts for the shape of the contract. We define this measure of concavity as the difference between the last and the first marginal compensation rates, divided by the effective marginal compensation rate (henceforth, *Coles' Incentive Rate* or *CIR*). Thus, it takes the values of zero for linear contracts and negative values for concave contracts, with concavity being decreasing with the increase in this variable.

However, this measure of concavity only takes into account the first and the last fee rate, but not the entire shape of the contract. Therefore, we develop a second measure of concavity: the ratio of the weighted average of the marginal compensation rates (i.e. the linearized compensation rate) to the first applicable marginal compensation rate, henceforth, *Weighted Incentive Rate (WIR)*. This measure of concavity is equal to one for linear contract and less than one for concave contracts, with concavity being decreasing in this variable. For the slope of the compensation contract, we use the *Effective Fee Rate (EFR)*. This is defined as the compensation rate being paid to the manager based on the current net assets of the fund as reported in the NSAR filing. All the three measures (i.e., CIR, WIR and EFR) are increasing in the incentives. It is worth noting that EFR represents the average compensation rate, while WIR and CIR represent the part of the compensation more directly related to the incentives.

B. Measures of herding

The measures of category herding, we use the number of funds in the category as the proxy for the degree of herding conduciveness of a category (H_C). We rank the categories annually based on the number of funds in increasing order.

The measures of stock herding are constructed from the holdings data from CDA/Spectrum. We only look at the sample of funds that are matched with the NSAR database and analyze their trading behavior. The first measure of herding at the stock level is constructed as in Lakonishok, Shleifer and Vishny (1992). This measure of herding, defined as the Unsigned Herding Measure (*UHM*), is based on trades conducted by a subset of market participants over a period of time. In our case, this subset is represented by the funds belonging to one of the 5 fund categories – LG, AG, GI, BL and IE as per the ICDI classification in CRSP database. Let *B(j,t) [S(j,t)]* be the number of funds in the subset who buy [sell] stock *j* in quarter *t*. Then *UHM(j,t)* is given by:

$$UHM(j,t) = \left|p(j,t) - p(t)\right| - E\left|p(j,t) - p(t)\right|$$

where *p(j,t)=B(j,t)/[B(j,t)+S(j,t)]*, and *p(t)* is the average of *p(j,t)* over all stocks *j* that were traded in quarter *t*. The second term is an adjustment factor (*AF*) that accounts for bias in */p(j,t)-p(t)/* that may arise in stock-quarters which are not traded by a larger number of funds. *AF* is calculated under the null hypothesis that *B(j,t)* follows a binomial distribution with parameter *N(j,t) = [B(j,t)+S(j,t)]* and *p(t).* Under the null hypothesis, *AF* will go towards zero as the number of funds active in a stock-quarter increase.

Next, the set of funds are split into two groups of high fee group and low fee group based on the median values of effective fee rate within each category. The *UHM* measure is then re-calculated for each of the two groups separately. In these re-calculations, the values of $p(t)$ and the adjustment factor are also calculated separately for each group. Since the identities of the market participants are different in the two groups, the *UHM* measure would also be different for each of the two groups. Similarly, *UHM,* $p(t)$ and *AF* are calculated for each of the 5 categories individually and then, for the two groups of high fee and low fee within each category.

To construct a herding measure at the individual fund level, we follow a methodology similar to Grinblatt, Titman and Wermers (1995). We define the Signed Herding Measure (*SHM*) that provides an indication of whether a mutual fund is following the crowd or going against it. For fund *i*, the *SHM* measure is given by

$$SHM(i,j,t) = I(i,j,t)\times UHM(j,t) - E[I(i,j,t)\times UHM(j,t)] \ ,$$

where $I(i,j,t)=0$ if $|p(j,t)-p(t)|<E|p(j,t)-p(t)|$; $I(i,j,t)=1$ if $\{p(j,t)-p(t)|\}>E|p(j,t)-p(t)|$ and the mutual fund is a buyer of the stock *j* in quarter *t*, or $-\{p(j,t)-p(t)|\}<E|p(j,t)-p(t)|$ and the mutual fund is a seller ; $I(i,j,t)=-1$ if $\{p(j,t)-p(t)|\}>E|p(j,t)-p(t)|$ and the mutual fund is a seller of the stock *j* in quarter *t*, or $-\{p(j,t)-p(t)|\}<E|p(j,t)-p(t)|$ and the mutual fund is a buyer. The $UHM(j,t)$ measure is calculated using all the funds from the five categories as the set of market participants. Additionally, we put the restriction that $SHM(i,j,t)=0$ if fewer than 10 funds are active in that stock-quarter. The indicator variable $I(i,j,t)$ captures the fact of whether the mutual fund is buying (selling) stock *j* when there are more buyers (sellers) in the same category, i.e. whether the mutual fund is herding with the crowd. The expectation term is calculated as in Grinblatt, Titman and Wermers (1995) and the explanation below replicates the footnote (20) in their paper.

Under the null hypothesis of independent trading decisions among funds, the number of trading funds that are buyers is binomially distributed. We can calculate the value of $E[I \times UHM]$ for stock *j* in quarter *t* using as parameters of the binomial distribution the number of funds trading stock *j* in quarter *t* ($N(j,t)$) and the proportion of trading funds in the population that are buyers ($p(t)$). Then for stock *j* in quarter *t*, we have:

$$E[I\times UHM] = \sum_{p:\{p-p(t)\}>E|p-p(t)|}(2p-1)\times UHM(p)\times Pr(p) - \sum_{p:-\{p-p(t)\}>E|p-p(t)|}(2p-1)\times UHM(p)\times Pr(p)$$

where, for the $N(j,t)$ discrete values that p can assume,

$$Pr(p) = \binom{N}{Np} p(t)^{Np} \{1 - p(t)\}^{N-Np}$$

Finally, the stock herding measure for the *i*th fund ($H_{S,i}$) in a calendar year is calculated as :

$$H_{s,it} = \sum_j \{ w(j,t) - w(j,t-1) \} \times SHM(i,j,t)$$

$$H_{s,i} = \frac{1}{T} \sum_t H_{s,it}$$

where $w(j,t)$ is the portfolio weight on stock j at time t and T is the number of quarters in a calendar year that we have the measure of stock herding for fund i.

C. Measure of fund performance

We measure fund performance using a four factor model, where the four risk factors are Market, SMB, HML and UMD. This model has been used in the mutual fund performance analysis literature, starting from Carhart (1997) onwards, and has been shown to have good explanatory power for the observed cross-section of fund returns. Therefore, we run:

$$R_i - r_f = \alpha + \beta_1 (MKT - r_f) + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + \varepsilon_i$$

R_i is the fund return net of expenses for fund i, r_f is the risk-free rate and the four risk factors are denoted by *MKT*, *SMB*, *HML* and *UMD*. The risk-adjusted return is α, the intercept of this regression.

D. Measure of unobserved actions

To measure the activism of mutual funds, we follow the same methodology as Kacperczyk *et al.* (2005). We calculate the return gap of the funds, defined as the difference between the investor return and the buy-and-hold return from their disclosed portfolio. We proceed as follows. We first construct the buy-and-hold portfolio that includes the most recently disclosed stock positions. For each month t, and fund f, the return from this portfolio is defined as the holding return (RH):

$$RH_t^f = \sum_{i=1}^{I} \tilde{w}_{i,t-1}^f R_{i,t}$$

where, $\tilde{w}_{i,t}^f$ is the portfolio weight in stock i of fund f at month t and $R_{i,t}$ is return of the stock i over month t. If a fund disclosed its portfolio in the previous month, the portfolio weight in stock i depends on the number of stocks held (n) and the stock price (P) so that:

$$\tilde{w}^{f}_{i,t-1} = \frac{n^{f}_{i,t-1} P_{i,t-1}}{\sum_{i=1}^{I} n^{f}_{i,t-1} P_{i,t-1}}$$

Otherwise, if the disclosure is more than one month prior to month *t*, then we use the most recent holdings disclosed at time *t-τ* and update the weights assuming that the fund manager follows a buy-and-hold strategy, so that:

$$\tilde{w}^{f}_{i,t-1,\tau} = \frac{n^{f}_{i,t-\tau} P_{i,t-\tau} \prod_{j=1}^{\tau-1} (1 + R_{i,t-j})}{\sum_{i=1}^{I} n^{f}_{i,t-\tau} P_{i,t-\tau} \prod_{j=1}^{\tau-1} (1 + R_{i,t-j})}$$

Based on the above buy-and-hold portfolio return, we define the return gap *(RG)* as the difference between the investor return and the return of the buy-and-hold portfolio after adjusting for expenses.

$$RG^{f}_{t} = (R^{f}_{t} + Exp^{f}_{t}) - RH^{f}_{t}$$

The adjustment for expenses is necessary because the CRSP database reports the mutual funds' return net of their expenses.

E. Other variables

Our measure of *New Money Inflow* is the dollar inflow as a fraction of total net assets of the fund. From NSAR, we know the number of portfolio accounts that a mutual fund has, i.e. the number of investors in the fund. Dividing the total net assets by the number of investors, we get the size of an average shareholder account. The turnover is defined as the maximum of sales and purchases divided by the total net assets of the fund. The 12b-1 expenses and the minimum initial investment required are used as additional control variables in the subsequent analysis. About 0.41% of the funds have a performance based compensation part tied to the performance of their own fund and about 0.91% of the funds have a part of their compensation linked to their rivals' performance.

From the CRSP Mutual Fund database, which is reported at the fund-class level, we aggregate the return data at the fund level, weighting the return of each class by the total net assets of the class. The annual return is the compounded monthly return of the fund for the calendar year. The volatility of the funds' return is constructed as the standard deviation of monthly returns in the calendar year. The fund's age is the number of years the fund has been traded. If different classes of funds have different age, then we take the highest among them. The expense ratio is the weighted-average of the expense ratios of different classes of a single fund.

From the full sample of funds in the CRSP Mutual Fund database, we rank the 23 categories, as per ICDI classification, each calendar year based on the number of funds in that category. The category with rank 1 is the smallest category, while the 23rd ranked category is the largest one. Appendix C tabulates the different categories with the average number of funds in them over the entire sample period. As we argued in the previous sections, the size of the category is a proxy of the effectiveness with which managers can pursue a herding strategy. The higher (lower) the number of funds in the category, the easier it is to pursue a herding (risk-taking) strategy.

We use two measures of risk-taking - volatility of fund returns and changes in volatility of fund returns from first semester to second semester in a calendar year. The volatility of fund returns is the standard deviation of monthly returns for the twelve months in a calendar year. The change in volatility is the difference in volatility of the monthly returns from the January-June period to the July-December period, in line with the literature on mutual fund tournaments (Brown *et al.*, 1996). We rank the funds at the end of the January-June period within their categories using their total return in the period.

III. Main Findings

A. Incentives and category herding

We first study category herding. We implement a two-step procedure based on instrumental variables, as described in the methodology section. The measures of concavity and average fee rate are our proxies for contractual incentives. We estimate:

$$H_{C,it} = \alpha + \beta C_{it} + \gamma F_{it} + \delta X_{it} + \varepsilon_{it} \qquad (1)$$

where, for the *ith* fund at time t, $H_{C,it}$ is the ranking of the category based on the number of funds in the category, C_{it} represents the incentives contained in the advisory contract, F_{it} is the size of the family the fund belongs to and X_{it} is the vector of control variables as defined above. To control for the potential endogeneity of the contract, C_{it} is first projected on the set of instruments and exogenous variables as explained before. Given that we have advisory contract data from NSAR filings at annual frequency, we estimate equation (1) at annual frequency. In calculating the standard errors of the estimates, we use a heteroscedasticity consistent variance-covariance matrix. Additionally, we adjust the standard errors of the estimates to allow for clustering at the fund and fund-family level.

We estimate the above equation in an ordered-probit framework, where the dependent variable takes discreet values based on the ranking of the categories.[5] The categories are ranked each calendar year on the basis of the number of funds competing in the category with 1 being the category with the fewest funds. We use alternative measures of incentives as defined above.

The results are reported in table 2. Panel A presents the results with Coles' incentive rate (CIR) and Effective fee rate (EFR) as the measures of incentives in the advisory contracts while panel B presents the results using Weighted incentive rate (WIR) and Effective fee rate (EFR). In both panels, columns (1)-(3) uses the logarithm of family TNA as the proxy for family size, while columns (4)-(6) uses the logarithm of the number of funds in the family as the proxy for family size. Columns (1) and (4) present the standard errors of the estimates using White's heteroscedasticity consistent variance-covariance matrix, columns (2) and (5) allow for clustering of the observations at the fund level, while columns (3) and (6) allow for clustering at the fund-family level. We recall that our working hypothesis requires the coefficients β and γ to be negative.

We find strong support for the working hypothesis. Managers with higher incentive contracts would prefer a less herding conducive category. This result is robust for different specifications and for different definitions of incentives – i.e. Coles' incentive rate and Weighed incentive rate. The effect of the incentives on the choice of the category is not only statistically significant, but also economically significant. A one standard deviation increase in the Coles' incentive rate reduces the probability of choosing one of the three largest categories from 0.2476 to 0.1412, i.e. a decrease in probability of 0.1064. On the other hand, the probability of choosing one of the three smallest categories increases from 0.0158 to 0.0401, i.e. an increase in probability of 0.0243.[6] Similarly, for one standard deviation increase in weighted incentive rate, the increase in the probability of operating in one of the three smallest categories is 0.0321; while the decrease in probability of choosing one of the three largest categories is 0.1239. For the effective fee rate, one standard deviation increase

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[5] We obtain similar results in a linear regression where the dependent variable takes the values of the number of funds competing in the category, instead of the categories' ranks.

[6] It is calculated as follows: at the mean level of incentives, the probability of choosing a category ranked j is $\Pr\{H_{C,i} = j\} = \Pr\{\kappa_{j-1} < \hat{H}_{C,i} < \kappa_j\}$, where $\kappa_1, \kappa_2, \ldots.., \kappa_J$ are the cut points for J possible outcomes. If the incentives are increased by one standard deviation, i.e. βC, then the new probability of choosing category ranked j becomes equal to $\Pr\{H_{C,i} = j\} = \Pr\{\kappa_{j-1} < (\hat{H}_{C,i} + \beta C) < \kappa_j\}$. From column (1) of table 2, we see that β=-2.7145 and the standard deviation of estimated C is 0.1546. Hence, βC= (-2.7145*0.1546) =-0.4197. Now, the average probability of choosing one of the three smallest categories is equal to 0.0158. After increasing the incentives by one standard deviation, the new probability of choosing one of the three smallest categories becomes equal to 0.0401. Hence, the increase in probability of choosing one of the three smallest categories is 0.0401 - 0.0158 = 0.0243. Similarly the probability of choosing one of the three largest categories decreases from 0.2476 to 0.1412, i.e. a decrease in probability of 0.1064.

in EFR increases the probability of choosing one of the three smallest categories by 0.0390 and decreases the probability of choosing one of the three largest categories by 0.1365.[7]

What is the effect of family affiliation on category herding? In section 2, we posited that managers of funds belonging to larger families should have higher inclination to take risk, i.e. to herd less. Indeed, our results indicate that such managers choose a less crowded category. We find a significantly negative relationship in support of our hypothesis. An increase in the size of the family by one standard deviation increases the probability of choosing one of the three smallest categories by 0.0144; while it decreases the probability of choosing one of the three largest categories by 0.0762.[8] The magnitudes of the two affects seem to indicate that the relative importance of contractual incentives and family affiliation is of the same order of magnitude in the decision to enter a particular category.

One of the potential explanations for the choice of a category could be the demand for funds belonging to the category among the mutual fund investors. We use the logarithm of total dollar inflows, standardized by the size of the category in terms of total TNA, as a proxy for this demand. Indeed, investor demand is highly positively correlated with the size of the category, i.e. funds choose categories for which investor demand is stronger. Our main results are robust to controlling for the investors' demand.

Apart from incentive and family affiliation as a determinant of the choice of category, category herding is also negatively related to fund size and age. Larger and older funds seem to be in less herding conducive categories, i.e., in categories with fewer funds. This may indicate the existence of collusion among the funds within such categories and hence, the barrier to entry for a new fund being higher. In other words, small, young funds tend to herd more by choosing categories with many other funds. The inflow to the fund is also negatively correlated with the choice of a herding conducive category.

It is important also to note that there is strong support for the validity of our identifying variables. Bigger accounts should proxy for a higher interest in monitoring (and potentially coordination among account-holders) and therefore higher ability to impose a "tougher" contract on the manager. We conjectured that this contract should be structured in a way that produces the highest incentives per unit of compensation. That is, it should have a higher incentive component for a given level of fee rate. And indeed, we find that the higher the average size of the investors' accounts, the higher the incentives (WIR and CIR). Also, the higher the expense ratio, the lower are the incentives. The results hold strongly across all specifications. The correlation between the error term from the second-step and

[7] The economic significances of WIR and EFR are calculated based on the results of table 2; panel B, column (1).
[8] Based on the specification using WIR (table 2, panel B, column (1)). The magnitude of the effect on the choice of categories based on the specification using CIR is similar.

the instruments is less than 5% in all cases. This supports the robustness of the instrumental variable estimation and the validity of the chosen methodology.

As additional robustness check, we focus on the equity-focused funds only. We include only those funds that have more than 80% of their assets invested in equities, as reported in the CRSP database. The results are reported in table 3. They are similar to the ones for the overall sample and show a strong negative impact of the incentives and family affiliation on category herding.

One alternative explanation for our findings may be related to the supply of managers. That is, in larger categories, a higher supply of managers may reduce the fees charged to manage a fund. Doing something that a lot of other people are able to do elicits lower remuneration. However, the following tests, directly focused on trading behavior of the funds, give more conclusive evidence that increased incentives lead to lower herding.

B. Incentives and stock herding

We focus on equity funds to analyze herding behavior in stock trades.[9] We start by looking at the Unsigned Herding Measure (*UHM*). Table 4 presents the univariate statistics for this measure. In panel A, we calculate the UHM measure after aggregating the funds across all the 5 categories. The mean *UHM* in our sample is 2.42% with at least 5 active trades – i.e., at least 5 funds trading the stock in the quarter – and 3.04% with at least 10 active trades. This is similar in magnitude to the findings of 2.7% by Lakonishok, Shleifer and Vishny (1992) for a sample of pension funds, 4.32% by Grinblatt, Titman and Wermers (1995) for a sample of 274 mutual funds and 3.40% by Wermers (1999) with a much larger sample of mutual funds. One noticeable difference with Wermers (1999) is that, for our sample, the herding measure is increasing in the number of active trades. With at least 50 active trades, the mean *UHM* rises to 4.11%.

Next, we split our sample of funds into two groups: the high fee group and the low fee group, on the basis of the median value of the effective fee rate within each category. We then recalculate the *UHM* measure separately for each group, with *p(t)* and the adjustment factor being computed for each group individually. We take only those stock-quarters where we have at least the minimum number of active traders (5, 10, 20, 30 or 50 - as reported in the table) for both the high fee and the low fee groups. If managers with more incentive-loaded contracts are likely to pursue a more risky strategy – i.e. less herding – then we should expect a significant difference in *UHM* between the two groups. Panel A

[9] We concentrate on the following five categories according to the ICDI classification: aggressive growth (AG), long-term growth (LG), growth and income (GI), balanced (BL), and international equity (IE) consistent with Wermers (1999).

of table 4 shows that this is indeed the case. For different levels of minimum number of active traders, we find that the *UHM* measure for the high-fee sample is significantly lower than the analogous measure for the low-fee sample. For at least five active trades in a stock-quarter, the difference is 1.66%, with this difference increasing in the minimum number of active trades in the stock-quarter. For stock-quarters with at least 50 active trades, the UHM measure for the low fee group is 10.34% while it is only 7.55% for the high-fee group.

Then, we separate our sample into the 5 different ICDI categories. The *UHM* measure is calculated for each of the 5 categories separately, using the in-sample values of *p(t)* and the adjustment factor for each of the categories. The results are presented in panel B of table 4 for stock-quarters with at least 5 active trades. Each category is split into the high fee group and low fee group on the basis of the median value of the effective fee rate in that category. The *UHM* measure is re-calculated separately for the high fee and low fee groups for each of the categories. Again, we include only those stock-quarters with at least 5 active trades in both the high-fee and low-fee groups. The results confirm our previous findings about the difference in the herding measure between the high-fee group and the low-fee group. For each of the sub-sample of categories, we find that the high-fee group is herding significantly less than the low fee group. The results support our hypothesis that managers with a high incentive contract are likely to adopt a more risky strategy and engage less in trade based herding.

In order to provide a multivariate test of the above result, we cast our stock-herding hypothesis in terms:

$$H_{S,it} = \alpha_H + \beta_H C_{it} + \gamma_H F_{it} + \delta_H X_{H,it} + \nu_{H,it} \quad (2)$$

where for the *i*th fund in period *t*, H_{it} represents our measure of stock herding, F_{it} is the size of the family to which the fund belongs and $X_{H,it}$ is a vector of control variables including age, inflow, size, turnover, prior return and volatility, 12b-1 expense, minimum required investment, performance based fee and fee on rival performance. We use three alternative estimating procedures: a pooled regression with robust standard errors and clustering at the fund, family and year levels; a between-effect regression in which the time-series mean of the dependent variable is regressed on the time-series mean of the independent variables for each fund; and a Fama-Macbeth procedure where we take the time-series mean of the cross-sectional quarterly estimates. This allows us to control for the potential issues due to the autocorrelation of the main variables, which might lead to lack of independence of observations across time. We again use a two-step instrumental procedure, as defined before. All equations include category dummies. We expect $\beta_H<0$ and $\gamma_H<0$.

We report the results in Table 5. Column (1)-(4) present the pooled regression estimates with heteroscedasticity consistent variance-covariance matrix, with the standard errors being adjusted for clustering at the fund level in column (2), at the fund-family level in column (3) and at the year level in column (4). Column (5) presents the estimates from the between-effect regression while column (6) presents the estimates from the Fama-Macbeth procedure. Panel A uses the Coles' incentive rate and effective fee rate as measures of incentives; while Panel B uses the weighted incentive rate and effective fee rate. Also in this case, the results support our working hypothesis. There is a strong negative correlation between stock herding and incentives (i.e., $\beta_H<0$). That is, higher incentives reduce herding. This holds for different definitions of incentives (i.e., Weighed incentive rate, Coles' incentive rate, and Effective fee rate) and across different specifications.

The economic relevance of the measure is quite striking. The effect of an increase in the incentive is highly significant - one standard deviation increase in the incentives reduces the stock herding measure by about 0.93 standard deviation in the case of Coles' incentive rate, about 0.92 standard deviation in the case of weighted incentive rate, and about 0.84 standard deviation in the case of effective fee rate. The second main finding is related to family affiliation. Funds that belong to bigger families herd less. An increase in the size of the family by 1 standard deviation reduces the stock herding measure by 0.70 standard deviations. This is in line with our previous results that families induce managers to engage in more risky strategies. The result is robust to different specifications.

We also find that larger funds and older funds engage less in stock-herding, consistent with the results on category herding. However, we do not find any strong effect of new money inflow on herding. In unreported tests, we control for the funds' *alpha* instead of the raw return and volatility. Our main results are robust after controlling for *alpha*.

C. Incentives and risk taking

We now focus on risk taking. We consider two specifications. First, we relate incentives to annual volatility of monthly fund returns. We regress fund return volatility on our incentive variables and a set of control variables. We estimate:

$$\sigma_{it} = \alpha_{R,1} + \beta_{R,1} C_{it} + \gamma_{R,1} F_{it} + \phi_{R,1} X_{R,it} + \nu_{R,1,it}, \quad (3)$$

where, for the ith fund at time t, σ_{it} is the annual volatility of monthly returns for each fund. F_{it} is the size of the family to which the fund belongs and X_{it} is a vector of control variables including age, inflow, size, turnover, 12b-1 expense, minimum required investment, performance based fee and fee on rival performance. To control for the effects of market-wide events that might have an impact on the volatility and return of the funds, we also include the return and volatility of the median fund in the calendar year among the control variables. Our sample includes only equity funds belonging to one of the 5 ICDI categories - LG, AG, GI, IE or BL - with more than 80% of their assets invested in equity. We exclude funds that are less than two years old from the analysis.

In column (1), we report the pooled regression estimates with heteroscedasticity consistent variance-covariance matrix, while the ones with the standard errors adjusted for clustering at the fund level, fund-family and year level are reported in columns (2), (3) and (4) respectively. The estimates from the between-effect regression are reported in column (5).[10] We adopt a two-step procedure in which the average account size and the expense ration are used as instruments for the contractual incentives. All the equations include category dummies. We expect $\beta_{R,1}>0$ and $\gamma_{R,1}>0$.

The results are reported in Table 6. Panel A uses the Coles' Incentive Rate and Effective Fee Rate as the measures of incentives in the advisory contracts, while panel B uses the Weighted Incentive Rate and the Effectives Fee Rate as the measures of incentives. The findings support the working hypothesis. Indeed, contractual incentives increase risk taking. $\beta_{R,1}$ is consistently positive and significant across the different specifications. Moreover, the results are also highly economically significant. An increase in incentives of 1 standard deviation increases fund return volatility on average by about 0.28 standard deviation, 0.34 standard deviation and 0.61 standard deviation in the case of Coles' incentive rate, Weighted incentive rate, and Effective fee rate respectively[11].

Also, family affiliation increases risk taking. Funds that belong to bigger families take more risk (i.e., $\gamma_{R,1}>0$). An increase in the size of the family by one standard deviation increase fund return volatility by about 0.30 standard deviation.[12] The effect is again similar in magnitude to the effect of the incentive variables. The result is robust to different specifications. Among the control variables, it is interesting to notice that risk taking is positively related to new inflows. This is consistent with our hypothesis, as the higher the inflows, the stronger are the monetary incentives to perform well and the more these offset the reputation concerns. Also, older and bigger funds are more eager to take risk, possibly

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[10] Given that we use yearly volatility, we have only a limited number of cross-sections that would potentially create problem in calculating the statistical significance of estimates from the Fama-Macbeth procedure.

[11] The values are calculated as follows: the standard deviations of CIR, WIR and EFR for the sample used in the regression are 0.1427, 0.0813 and 0.1595 respectively; while the standard deviation of funds' return volatility is 0.0277. Hence, the economic impact of CIR is (0.0545*0.1427)/0.0277=0.28 standard deviation; economic impact of WIR is (0.1150*0.0813)/0.0277=0.34 standard deviation; and the economic impact of EFR is (0.1056*0.1595)/0.0277=0.61 standard deviation.

[12] From table 6, panel B, the coefficient of ln (family TNA) variable is 0.0034, while its standard deviation is 2.4539 in the sample used in the regression. Hence, the economic significance of Family Size is (0.0034*2.4539)/0.0277=0.30 standard deviation.

because more resources are available to them to outperform. This is consistent with previous findings suggesting that managers with better ability are less likely to herd.

We now consider a second specification aimed at capturing the aggressive behavior of the fund managers based on their mid-year performance. The specification is in the spirit of the "tournament literature" (Brown, Harlow and Starks, 1996; and Kempf and Ruenzi, 2004) in which the change in risk in the second part of the year relative to the first part is related to the ranking of the fund vis-à-vis its competitors in the first part of the year. We argue that the higher the incentives, the more additional risk the manager is willing to take in the second part of the year. We estimate:

$$\Delta\sigma_{it} = \alpha_{R,2} + \beta_{R,2} C_{it} + \gamma_{R,2} F_{it} + \theta_{R,2} Rank_{it} + \delta_{R,2} \sigma_{it}^{(1)} + \psi\Delta\sigma_{med,t} + \phi_{R,2} X_{R,it} + \nu_{R,2,it} \quad (4)$$

where, for the ith fund at time t, $\Delta\sigma_{it}$ represents the change in volatility of monthly returns for each fund from the first six months of the year to the last six months. $Rank_{it}$ is the ranking of the fund in the category based on the returns in the first semester of the year. Additionally, fund volatility in the first six months of the year ($\sigma_{it}^{(1)}$) is used as a control variable to control for the effect of mean reversion in fund return volatilities. We also control for other differences in category characteristics that might influence the risk-changing behavior by including the change in risk of the median fund in the category as one of our control variables. The other variables are defined as before.

As in the previous regression, the pooled regression estimates with heteroscedasticity consistent variance-covariance matrix are reported in column (1), while the ones with the standard errors adjusted for clustering at the fund level, fund-family and year level are reported in columns (2), (3) and (4) respectively. The estimates from the between-effect regression are reported in column (5). We adopt a two-step procedure in which the average account size and the expense ration are used as instruments for the contractual incentives. All the equations include category dummies. We expect $\beta_{R,2}>0$ and $\gamma_{R,2}>0$.

The results are reported in table 7. Panel A uses the Coles' Incentive Rate and the Effective Fee Rate as the measures of incentives in the advisory contracts, while panel B uses the Weighted Incentive Rate and the Effectives Fee Rate as the measures of incentives. We find that $\beta_{R,2}$ is consistently positive and significant across the different specifications. These results are robust to the different specifications. Moreover, the findings are also economically significant. An increase in the incentives of one standard deviation raises fund return volatility in the second period relative to the first period by about 0.06 standard deviation, 0.07 standard deviation and 0.05 standard deviation in the case of Coles' incentive rate, Weighted incentive rate, and Effective fee rate respectively.[13] Also in this case, family affiliation increases the change in risk taking as funds that belong to bigger families take more risk (i.e., $\gamma_{R,2}>0$). An increase in the size of the family of one standard deviation increases fund return volatility in the second period relative to the first period by about 0.06 standard deviation.

Our test confirms the result about mean reversion in fund return volatility documented in the prior literature (Daniel and Wermers, 2000). The change in risk is significantly negatively related to the level of risk in the first semester of the calendar year. We also find some evidence that the funds that are winners in the first period have a larger change in risk. However, this result is not significant when we allow for clustering at the year level. Among the other control variables, it is interesting to notice that the change in risk is positively related to fund size and new inflows. This is consistent with our hypothesis, as the higher the inflows, the stronger are the monetary incentives to perform well and the more these offset the reputation concerns. These findings further confirm that contractual incentives increase risk taking.

D. Incentives and survival

If incentive increases risk taking, it may also increase the probability that the fund is forced to liquidate due to large negative return shocks. That is, incentives may reduce the probability of survival of the fund. We perform a survival analysis using data on fund delisting from CRSP. We use both Cox semi-parametric hazard rate model and a parametric proportional hazard model, where the baseline hazard is specified to have an exponential functional form, on fund closure data. We estimate the hazard rate for fund *i* as:

$$h(t|Z_i) = h_0(t)exp(Z_i\beta), \quad (5)$$

where $h(t)$ is the hazard rate, that is the fraction of mutual funds alive prior to time t that die at t, Z is the vector of explanatory variables that includes incentive (C), size of the fund-family (F) as well as the other explanatory variables (X) as defined in the previous section. The vector β stacks the maximum likelihood estimates of the coefficients. The Cox model does not impose any parameterization on the baseline hazard rate $h_0(t)$, nor does it make any assumption about the shape of the hazard over time. The only assumption is that the shape of the hazard is the same for all the funds. In the parametric proportional hazard model that we estimate, the baseline hazard rate (i.e., $h_0(t)$) is specified to have the following

[13] The values are calculated as follows: the standard deviations of CIR, WIR and EFR for the sample used in the regression are 0.1484, 0.0786 and 0.1623 respectively; while the standard deviation of the change in return volatility is 0.0266. Hence, the economic impact of CIR is (0.0102*0.1484)/0.0266 = 0.06 standard deviation; economic impact of WIR is (0.0229*0.0786)/0.0266 = 0.07 standard deviation; and the economic impact of EFR is (0.0087*0.1623)/0.0266 = 0.05 standard deviation.

functional form: $h_0(t) = \exp(\psi)$ where ψ is an additional parameter to be estimated in the model.

We report the results in Table 8. In panel A, Coles' incentive rate (CIR) is used as the measure of incentive, while in panel B, the Weighted incentive rate (WIR) is the measure of incentive. We also include EFR, the level of advisory fee in our regressions. In both panels, columns (1) and (3) present the results of estimating the regression equation in a panel framework with the standard errors being adjusted for clustering at the fund level. In columns (2) and (4), we adjust the standard errors of the estimates to allow for clustering at the fund-family level. All specifications include year dummies to control for time fixed effects and category dummies to control for category fixed effects.

The results show that contractual incentives reduce the probability of survival (i.e., increase the hazard rate). This finding is robust across alternative specifications as well as for the different definitions of contractual incentives. The results are also highly economically significant. One percentage increase in incentives leads to an increase in hazard rate of about 7.50% in case of CIR and about 14.50% in case of WIR. This is equivalent to a reduction in the probability of survival of about 2%, both in the case where incentive is measured in terms of CIR and in the case where it is measured in terms of WIR.

It is interesting to note that also family affiliation reduces the probability of survival. Funds that belong to bigger families are less likely to survive. As in the previous case, the effect is similar in magnitude to the effect of the incentive variables and it is robust to different specifications and for alternative definitions of the contractual incentives. An increase in the log size of the family of one percentage reduces the probability of survival on average by about 4%. This is consistent with the findings in the literature suggesting that families tend to proliferate funds to generate "stars" (Nanda *et al.*, 2004).

Among the control variables, the alpha of the fund in the prior year and the size of the fund are two of the most important factors increasing the probability of survival for a fund. In economic terms, one percentage increase in prior year alpha raises the survival probability by 1.65%, while one percentage increase in log of fund size leads to an increase of 1% in survival probability. This may be due to a sort of "too big to fail" rationale. Big established funds are likely to be flagship funds for the families and therefore, they are less likely to be allowed to fail. Overall, these findings suggest that contractual incentives not only increase risk taking, but also reduce the survival probability of the funds.

E. Incentives and performance

We now consider performance. We start by relating incentives to the annual risk-adjusted return of the funds. We regress fund return on our incentive variables and a set of control variables:

$$R_{it} = \alpha_R + \beta_R C_{it} + \gamma_R F_{it} + \phi_R X_{R,it} + \nu_{R,it}, \quad (6)$$

where, for the *ith* fund at time *t*, R_{it} is the fund risk-adjusted return with respect to the 4-factor model over the calendar year. The other variables are defined as in the previous equation (1).

The results are reported in Table 9. Panel A uses the Coles' Incentive as the measures of incentive in the advisory contracts, while panel B uses the Weighted Incentive Rate. In order to control for the probability of fund survival, we also consider a specification inclusive of the survival probability among the explanatory variables. This is reported in columns (3)-(5). The probability of survival for a fund is estimated from the parametric hazard rate model discussed before. In columns (1)-(3), we report the panel regression estimates with heteroscedasticity consistent robust standard errors. We include category dummies in columns (2)-(5). All the specifications include year dummies. We adjust the standard errors by clustering at the fund level (column 4) and at the fund-family (column 5). We recall that we expect $\beta_R > 0$.

The findings show that contractual incentives increase fund returns. β_R is consistently positive and significant across the different specifications. Moreover, the results are also highly economically significant. An increase in incentives of 1 standard deviation increases risk-adjusted fund return by more than 50 basis points per year, both in the case of Coles' incentive rate and Weighted incentive rate. Also, funds belonging to larger families and older funds have higher return net of risk. Consistent with the theory of Berk and Green (2004), we find that funds that experience high inflows have significantly negative net-of-risk return. Also, prior year volatility seems to impact negatively the risk-adjusted return of the fund.

It is interesting to note that, not only performance is positively related to survival probability, but also the economic impact of the incentives on performance is higher once we control for survival. Indeed, given the negative relationship between survival and incentives and the positive relation between incentives and performance, we expect that the very funds that are less likely to survive are also the ones with higher performance ex-ante. Therefore, the bias would induce us to observe just the ones with lower performance and to underestimate the impact of the incentives on performance.

Next, we employ a portfolio-based estimation. We focus on portfolios of funds grouped on the basis of incentives and study their performance. This methodology allows us to control for the potential errors induced by the separate estimation of the risk-adjusted return for the funds as in the previous multivariate analysis. At the beginning of each year, we rank funds into quintile portfolios based on incentives. These portfolios are rebalanced every year. The portfolio returns are computed by equally-weighting the returns of the funds in the portfolio. We also form a spread portfolio between the highest incentive quintile and the lowest incentive quintile. As a result, we have a time-series of returns of the portfolios for 96 months in our sample period. We then regress the portfolio returns on the three Fama-French risk factors and the Momentum factor.

$$R_i - r_f = \alpha + \beta_1 (MKT - r_f) + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + \varepsilon_i \quad (7)$$

The results are reported in table 10, with CIR as measure of incentives in panel A and WIR as measure of incentives in panel B. The average monthly excess return for the top quintile is significantly higher than the bottom quintile. Before correcting for risk, the top quintile has an excess return of 60 basis points per month, while the bottom quintile's excess return is only 38 basis points per month. Indeed, the spread portfolio has a risk-adjusted return of 22 basis points in panel A (25 basis points in panel B) per month above the four risk factors of Market, SMB, HML and UMD. The other interesting result is the loading on Book-to-Market and Momentum factors. The high incentive funds loads significantly higher on the HML factor and significantly lower on the UMD factor than the low incentive funds.

In the next table (11), we perform the same analysis, but accounting for survival probability. We do this through relative ranking of funds based on incentives within groups sorted on survival probability. We proceed as follows. First, funds are sorted into 5 groups on the basis of their survival probability. Within each of the 5 groups, these funds are further sorted into quintile portfolios on the basis of their incentives. In the next step, the top incentive quintiles from each of the 5 groups are combined to form the portfolio of the highest incentive funds. Similar aggregation is done for the other incentive quintiles. The 5 resulting portfolios of mutual funds sorted on incentives have similar variation in survival probabilities across them. Figure 1 provides graphical illustration of this procedure.

Once the portfolios have been constructed, we estimate performance as the intercept from a regression of excess portfolio return on the 4 risk factors. The results are similar in economic and statistical magnitude to those reported in Table 10. The spread portfolio has an alpha of around 22 basis points per month and loads positively on the HML factor and negatively on the UMD factor. Overall, the findings reported in Tables 4-6 provide direct evidence that incentives not only increase risk, but they also increase the performance net of risk.

F. Incentives and performance persistence

An important dimension in our analysis is the persistence in fund performance. As we mentioned before, if incentives increase managerial efforts this should translate in higher and *more stable* net-of-risk performance. To study the persistence in performance, we employ the standard test on mutual fund performance persistence as defined in Carhart (1997) as well as a probit analysis.

F.1 A portfolio approach to persistence

We first employ the standard persistence methodology based on aggregating funds in portfolios. On 31st December of each year, funds are sorted into decile portfolios based on their risk-adjusted return for the calendar year as resulting from a factor model with the three Fama-French and the Momentum factors. Then, for the following years, the returns on these alpha-sorted portfolios are calculated by equally weighting the returns of the funds in each of the portfolios. Also, a spread portfolio is constructed as the difference between the top and bottom deciles. The time-series of portfolio returns are then regressed on the risk-factors. A significant intercept in this regression provides evidence of persistence in performance.

In order to test whether incentives have an effect on performance persistence, we modify the standard test on persistence as in Carhart (1997) as follows. We first form quintile portfolios of funds based on prior year risk-adjusted return. Then, within each quintile, we separate funds into 5 equal groups based on incentives. We define the funds with highest incentives as the high incentive group and the funds with lowest incentives as the low incentive group within each quintile. The procedure creates 5 alpha sorted portfolios of high incentive funds and another 5 alpha sorted portfolios of low incentive funds. Then, for the following year, the portfolio returns are calculated by equally weighting the returns of the funds in the portfolios. We also form spread portfolios between the best and worst performing funds for both the high incentive group and the low incentive group.

To capture the difference in performance between funds having similar prior return but different incentives, we also form two long-short portfolios. In the first one, we are long in the funds that belong to the top alpha quintile in the high-incentive group and are short in the funds that belong to the top alpha quintile in the low-incentive group. In the second one, we are long in the funds that belong to the bottom alpha quintile in the high-incentive group and are short in the funds that belong to the bottom alpha quintile in the low-incentive group. We then regress the portfolio returns on the four risk factors (Market, SMB, HML and UMD).

The results are reported in Table 12. Panel A uses CIR as the measure of incentive while Panel B uses WIR. The results show evidence of performance persistence among the funds with high incentive contracts. While the top quintile portfolio has an alpha of 41 basis points per month in Panel A (25 basis points per month in Panel B), the bottom quintile portfolio has a negative alpha of 77 basis points per month in Panel A (negative 64 basis points in Panel B). The spread portfolio between the top quintile and the bottom quintile has an alpha of 118 basis points per month in panel A (90 basis points in panel B). That is, unlike the previous findings in the literature, performance persists not only for the worst performing funds, but also for the best performing ones with high incentives. No analogues persistence is present for funds with low incentive contracts.[14]

These results are quite striking. The failure of the previous literature in documenting performance persistence can be addressed by conditioning on the incentives of the funds. Indeed, the alleged lack of persistence may be simply due to the fact that funds with high incentives and low incentives were grouped together. Our study provides one simple conditioning variable, i.e. incentive in the advisory contract, which fund investors can use to predict future out-performing funds.

Our results are also robust to controlling for the survival probability of the fund. To account for it, we modify the sorting procedure as follows. We first sort the funds each year into 5 groups based their survival probability estimated from our hazard rate model. Then, within each group, the funds are sorted into quintiles based on their prior year risk-adjusted return. In the next step, the top performance quintiles from each of the 5 survival groups are aggregated to form the quintile portfolio of funds with the highest prior year performance. Similar aggregation is done to obtain the other quintiles of funds. The resulting 5 quintiles of funds sorted on prior year performance have similar variations in survival probability across them. Within each quintile, we split the funds into 5 groups based on their incentives. Then, we proceed as before to form the performance sorted portfolios for both the high incentive group and the low incentive group.

The results are reported in Table 13. They are similar in economic and statistical magnitude to those in Table 12. High incentive funds show significant evidence of performance persistence, while no persistence is observable among low incentive funds. Among the high incentive funds, the top quintile portfolio has an alpha of 37 basis points per month in Panel A (26 basis points per month in Panel B), the bottom quintile portfolio has a negative alpha of 67 basis points per month in Panel A (negative 71 basis points in Panel B). The spread portfolio between the top quintile and the bottom quintile has an alpha of 104 basis points per month in panel A (98 basis points in panel B). Also, investors can earn

[14] In fact, by being long in prior year best performing funds with high incentives and being short in prior year best performing funds with low incentives, an investor can earn an alpha of 71 basis points per month in Panel A (49 basis points in Panel B).

a positive alpha of 74 basis points per month in Panel A(57 basis points in Panel B) by being long in the prior year best performers with high incentives and being short in the prior year best performers with low incentives.

As additional robustness check, we test whether our results are robust to an alternative method of sorting the funds. Instead of sorting the funds on performance first and then on incentives, we do the opposite. We also control for survival probability. Similar to the methodology above, we first sort funds into 5 groups based on survival probabilities. Then, within each group, funds are sorted into 5 groups based on incentives. Next, incentive groups are aggregated from different survival groups as in the previous section. The resulting groups of funds sorted on incentives have similar variation in survival probabilities across them. Then, within each of the highest and the lowest incentive groups, the funds are further sorted into quintile portfolios based on prior year risk-adjusted return.

The results are reported in Table 14. They are similar in economic and statistical magnitude to those in Tables 12 and 13. Indeed, the portfolio of high incentive high past performance funds has a positive alpha of 39 basis points per month, while the portfolio of high incentive low past performance funds has a negative alpha of 52 basis points per month. No such persistence is obtained for the portfolios of low incentive funds. In fact, the high incentive high past performance portfolio outperforms the low incentive high past performance portfolio by 70 basis points after adjusting for systematic risk.

F.2 A multivariate approach to persistence

We now perform a multivariate analysis of performance persistence. We employ a probit model in which the dependent variable takes a value of 1 if the fund has been a winner in the current year as well as the previous year, while it takes the value of 0 otherwise. We define as winners the funds with a risk-adjusted return greater than the median fund for a given year. The independent variables in the probit model include measures of incentives and other control variables as defined in previous sections.

The results are reported in Table 15. The impact of incentive is positive and significant. One percentage increase in incentive leads to an increased probability of winners' persistence of 4.33% (7.74% in Panel B). This result is robust to whether we define incentives in terms of CIR or WIR. Moreover, it is interesting to note that winner funds of larger families are more likely to repeat their performance in the following year. Also, the probability of repeating by a winner fund is positively related to its survival probability. However, it is negatively related to new money inflow, consistent with the prediction of Berk and Green (2004).

G. Incentives and managers' unobserved actions

We now examine more in detail the channel through which incentives affect performance. We focus on the fund return that is obtainable by following a buy-and-hold strategy on the fund's disclosed portfolio and the return gap, which is the difference between gross fund return and buy-and-hold fund return. A higher buy-and-hold return signals better portfolio allocation decision by the fund manager, while a higher return gap indicates a higher positive contribution to fund performance by the trading and dynamic rebalancing of the funds' portfolio. It has been shown that "unobserved actions of some funds persistently create value, while the actions of others destroy value" (Kacperczyk *et al.*, 2005). The return gap measure has been created to proxy for the unobserved actions of the managers in the absence of direct information on their short-term trading strategies. Indeed, despite extensive disclosure requirements, it is not possible to observe all the actions of the fund managers. The exact timing of the trades, transaction costs, dynamic trading strategies are all unknown.

Similar to our analysis on risk-adjusted fund returns, we form quintile portfolios sorted on incentives. We calculate the portfolio buy-and-hold return as the equally-weighted buy-and-hold return of the funds in the portfolio. The portfolio return gap is the equally-weighted return gap of the funds in the portfolio. We regress the portfolio buy-and-hold returns and portfolio return gaps on the risk factors.

We report the results for the buy-and-hold returns in Table 16 and those for the return gap in Table 17. In both tables, Panel A uses CIR while Panel B uses WIR as the measure of incentives. The results for the buy-and-hold returns indicate that there is no significant performance differential among the incentive sorted portfolios in terms of buy-and-hold return. The spread portfolio in both Panel A and Panel B has alphas that are statistically insignificantly different from zero. However, when we consider the return gap, we see a sizable and statistically significant difference among the incentive sorted portfolios. Both in Panel A and B, the high incentive portfolio have a positive return gap, while the low incentive portfolio has a negative return gap. Before risk adjustment, the high incentive portfolio has a return gap of 6 basis points per month (3 basis point in Panel B), while the low incentive portfolio has a negative return gap of 4 basis points per month (3 basis points in Panel B). The spread portfolio between the high incentive and low incentive funds has a positive and statistically significant alpha that is 13 basis points per month (10 basis points in Panel B).

As additional robustness check, we also perform a multivariate analysis on return gap. We regress the annual risk-adjusted return gap on incentives as well as the set of control variables as defined in the previous sections. The (unreported) results show that the coefficients on incentive are positive and significant, regardless of the proxy used to define the incentives.

These findings suggest that managers with higher incentives take actions that are beneficial to the funds' investors. The value created by their dynamic trading strategies more than offset the cost. Also, taken together with the lack of significance for the case of the buy-and-hold strategies, these findings suggest that the main channel through which incentives affect fund performance is through trading strategies and portfolio rebalancing. An investor that simply mimics the observed holdings of the high incentive funds and rebalances every quarter would not be able to generate a significantly positive alpha.

These findings show that contractual incentives play an important role by both increasing risk taking and improving performance. Moreover, the improvement in performance is not only due to the higher riskiness of the fund strategies, but to a genuine improvement in management. This would suggest that advisory contracts contain useful information to select funds. However, the question is how this could be possible in equilibrium. Indeed, if any observable fund specific characteristic were useful to forecast fund performance, rational investors would be massively investing in funds with those characteristics driving the other funds away from the market (Berk and Green, 2004).

One could argue that this does not happen as higher incentives, by increasing risk, also affect the survival probability of the fund. Given that the funds with more incentive-loaded contracts tend to be the riskier, they are also the most likely to disappear. So, attrition would actually eliminate all the very funds for which higher incentives imply higher performance. In other word, incentives, by affecting risk and survival, make it less likely for fund performance to persist. However, our analysis of survival, risk and performance suggest that this is not the case. We therefore leave this is as a puzzle providing additional evidence to the literature that claims that fund performance is predictable (Gruber, 1996).

H. Incentives and liquidity hedging

Finally, we consider whether incentives are related to the degree of liquidity of the portfolios of the funds. We regress the portfolio liquidity of the fund in a given year on the incentive structure defined as before and a set of control variables. The measure of liquidity of the portfolio is based on Amihud illiquidity ratio. The portfolio liquidity of the fund is then calculated as negative of the logarithm of value-weighted average of the individual stock's liquidity in the portfolio of the fund. Specifically,

$$Liq_{ft} = -\ln\left(\sum_i \theta_{it} I1_{it}\right)$$

where $\theta_{it} = \frac{n_{it} P_{it}}{TNA_{ft}}$ is the portfolio weight in stock i at time t in the portfolio of the fund f.

The results are reported in Table 18, Panels A and B. The structure of the table is similar to the multivariate tables before. The results show how that the level of compensation affects the degree of portfolio liquidity. In particular, there is a negative correlation between the incentive and liquidity. The higher the incentive, the lower is the degree of liquidity of the portfolio. One standard deviation increase in the overall level of compensation (EFR) leads to a reduction in portfolio liquidity of 0.46 standard deviation, while a one standard deviation increase in the incentives defined as CIR (WIR) reduces liquidity by 0.23 standard deviation (0.36 standard deviation).

These findings are consistent with the ones on risk taking and suggest that incentives, by increasing risk taking, also reduce the desire of the managers to hold liquid portfolios. Indeed, liquid portfolios provide an insurance against liquidity shocks, but the price of such insurance is lower return.

Conclusion

We test the corporate theory of managerial herding based on reputation and career concerns (Scharfstein and Stein, 1990) by focusing on the mutual fund industry and studying how contractual incentives affect managerial risk taking and herding. We consider two types of herding: category herding – the choice to operate in a herding conducive category, in which many other funds are already operating; and stock herding – a trading strategy similar to the one of the competitors.

We argue that reputation and career concerns induce managers to herd and that compensation contrasts this tendency. A more incentive-loaded compensation would induce managers to enter categories in which herding is less effective and to adopt trading strategies different from their peers, taking more risk. Family affiliation would reduce the incentive to herd and increase the one to take risk.

We test this on the US mutual funds in the period 1994-2003. We study the contracts remunerating the mutual fund managers and quantify the incentive component of the compensation package. We show that the contractual incentives reduce the managers' inclination to enter herding-conducive categories and to herd in their trading strategies and induce them to take more risk.

. We show that, in line with theory, incentives increase both performance and risk. Incentives directly affect the unobserved actions of the fund managers, defined on the basis of the funds' holdings as the difference between the return of the fund and the return of a buy and hold strategy based on the disclosed equity portfolio of the fund ("return gap"). Higher incentives improve performance by increasing the return gap.

By affecting performance and risk taking, incentives also affect the survival probability of the fund. An increase in the incentives reduces the survival probability of the funds. By properly controlling for the survival issue, we show that that high incentives fund persist in performing well. That is, funds with higher incentives systematically outperform the ones with low incentives.

Our findings extend beyond the mutual fund industry to the general situation of corporate managers operating in the presence of information asymmetry about their ability. In particular, they would describe well industries in which some features of winner-takes-all contest exist, such as the biotech industry or high R&D-intensive industries. Also, they would apply to industries characterized by intense competition, in which the compensation of the manager is related to the performance of the managers of the other firms competing in the same industry and decreases with rival firm performance.

Our findings have important implications in terms of the recent debate on mutual fund fees and managers' compensation in the US. Indeed, if herding exacerbates market fluctuations and generates bubble-type effects, higher compensation, by reducing herding may increase market stability. It would be interesting to quantify the impact on the underlying stock market of the contractual choice on the underlying stock market and its implications in terms of both volatility and crises. Moreover, it would be interesting to see how this affects the family-based structure of the mutual fund industry.

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Appendix A: The Merge of the CRSP Mutual Fund and Spectrum Datasets

Our merging procedure follows that of Wermers (2000). First, we perform a merge based on the ticker. The ticker is the five-digit code that is used to represent a stock or a mutual fund. The ticker in CRSP comes from the annual summary data file. The column called ticker has the NASDAQ ticker symbol as a five-character field. In Spectrum, the ticker comes from file 8, the Fund Ticker Information file. The fund ticker symbol here is also a five-character symbol.

An important shortcoming in using tickers, though, is that they are available for the years 1999, 2000 and 2001. We then have to extrapolate the 1999 tickers to prior years, whenever possible. Nonetheless, it should be noted that some funds' tickers were changed during the course of time. Some funds had died and their tickers had been reused. Thus, the reliability of the ticker merge weakens as we move back in time before 1999.

We therefore consider a second criterion: fund name. Unfortunately, the CRSP database uses a 50-character text field for the name, while Spectrum uses a 25-character field for the name of the fund. Thus, the names are abbreviated differently in both databases. We use a "name recognition" code written in Delphi to match the names. This code is based on the idea of matching two strings. The names of the two databases are arranged beside each other, and each name is compared with every name in the other database. Certain assumptions are made about the way fund names are abbreviated in Spectrum. For example, for each name, the word fund is dropped in Spectrum and company is abbreviated to Co. A match of 90% or more is considered to be a good match and is accepted. This match has a lower priority than the ticker merge. This means that if there is a conflict in the merge between the name merge and the ticker merge, the conflict is resolved by considering the ticker merge as valid.

Finally, for all the other cases, as well as the ones that seemed to be dubious, we perform an "eye match" i.e., funds are manually compared. A SAS program then combines the name match and the eye match to produce a final match.

Appendix B : Variable Definitions

	Variable	Database	Data Items Used	Explanation
	Contract Variables :			
1	Coles' Incentive Rate	NSAR - B	048A - 048K, 075A, 075B	Difference between the last and the first fee rates divided by the effective fee rate. It is zero for funds with linear contracts and negative for funds with concave contracts, with concavity being decreasing with increase in this variable.
2	Weighted Incentive Rate	NSAR - B	048A - 048K	Weighted average of the fee rates divided by the first applicable fee rate. It is equal to one for funds with linear contract and smaller than one for funds with concave contract, with concavity being decreasing with increase in this variable.
3	Effective Fee Rate	NSAR - B	048A - 048K, 075A, 075B	Effective marginal compensation rate based on the current reported total net assets of the fund.
	Category Variables :			
4	Number of Funds	CRSP Mutual Funds	ICDI, ICDI_OBJ	Total number of funds in a category after removing different classes of the same fund, excluding the fund in focus.
5	Category Inflow	NSAR - B, CRSP Mutual Funds	028G01, TNA, ICDI_OBJ	Total NAV of new shares sold summed across the funds in a category, as a fraction of the sum of TNAs of those funds.
	Instruments :			
6	Average Account Size	NSAR - B	075A, 075B, 074X	Total net assets divided by the number of shareholder accounts as reported by the mutual fund.
7	Expense Ratio	CRSP Mutual Funds	EXPENSES	Average of the expense ratios for different classes of the fund.
	Exogenous Variables :			
8	Number of Funds in Family	CRSP Mutual Funds	MGMT_NO	Total number of funds in the family calculated from CRSP database.
9	Family TNA	CRSP Mutual Funds	MGMT_NO, TNA	Total TNA of the family calculated from CRSP database.
10	Fund TNA	CRSP Mutual Funds	TNA	Total net assets.
11	Age	CRSP Mutual Funds	YEAR, F_DATE	Time in years since the mutual fund began trading. If different classes have different age, the highest value is taken.
12	New Money Inflow	NSAR - B	028G01, 075A, 075B	Total NAV of new shares sold as a fraction of total net assets.

13	Turnover	NSAR - B	071A, 071B, 075A, 075B	Maximum of total purchases and total sales, standardized by the net assets of the fund
14	Fund Return	CRSP Mutual Funds	RET	Gross return of the fund in the twelve months prior to the reported date of NSAR filing.
15	Fund Return Volatility	CRSP Mutual Funds	RET	Standard-deviation of returns of the fund in the twelve months prior to the reported date of NSAR filing.
16	12b-1 Expense	NSAR - B	043	Total expense of the mutual fund in pursuant of 12b-1 plan
17	Minimum Required Investment	NSAR - B	061	Lowest minimum initial investment required to become a shareholder of the mutual fund.
18	Performance Based Fee	NSAR - B	051	A dummy variable that indicates if the mutual fund has a own-performance based fee in the contract.
19	Fee on Rival Performance	NSAR - B	052	A dummy variable that indicates if the mutual fund has a rival-performance based fee in the contract.

Appendix C

Ranking of categories based on average of number of funds in the category in increasing order :

Rank	ICDI_OBJ Category	Mean Number of Funds	Median Number of Funds	Mean Effective Fee Rate (Percentage)
1	SP	3	3	0.5000
2	PM	32	34	0.7061
3	MY	34	34	0.3735
4	UT	49	50	0.4358
5	IN	113	112	0.5700
6	GM	120	115	0.3865
7	BY	143	150	0.4567
8	GB	172	176	0.5347
9	GE	190	202	0.7598
10	TR	193	199	0.5474
11	BL	244	259	0.4963
12	SF	282	252	0.7715
13	GS	300	313	0.4495
14	MQ	314	311	0.4119
15	MG	319	324	0.3386
16	MF	363	370	0.3917
17	MT	373	383	0.3444
18	GI	521	556	0.5056
19	BQ	534	551	0.4312
20	IE	592	648	0.7591
21	AG	663	723	0.7451
22	MS	747	733	0.4398
23	LG	908	991	0.6200

Table 1. Summary Statistics.

This table presents the summary statistics of the variables used in the subsequent analyses. Panel A presents the summary statistics of the independent variables, while Panel B presents the summary statistics of the return and volatility of the median equity fund (belonging to one of the following 5 ICDI categories: LG, AG, GI, BL and IE) in each calendar year over the sample period. The number of observations for each variable is given under the condition that the data on all the main variables should be non-missing. The descriptive statistics of Category Inflow is based on 223 unique observations. The definitions for each variable are provided in the appendix B.

Panel A: Independent Variables

Variable	N	Mean	Median	Std. Dev.
Coles' Incentive Rate	11410	-0.1121	0	0.1925
Weighted Incentive Rate	11596	0.9573	1	0.0893
Effective Fee Rate (in percentage)	11596	0.6451	0.6000	0.2625
Average Account Size (in thousands of dollars)	11596	0.9512	0.0365	3.8029
Expense Ratio (in percentage)	11596	1.2522	1.2000	0.6180
Family TNA (in billions of dollars)	11596	53.0086	15.4851	96.8886
ln (Family TNA)	11596	23.1529	23.4631	2.2350
Number of Funds in Family	11596	64.5490	43.0000	65.9492
ln (Number of Funds in Family)	11596	3.5404	3.7612	1.2832
Fund TNA (in millions of dollars)	11596	736.4280	149.1040	2413.1350
ln (Fund TNA)	11596	18.7966	18.8202	1.8554
Age	11596	6.5443	5.0000	6.3559
New Money Inflow	11596	1.3192	0.2167	21.6890
Category Inflow	11596	0.2338	0.0748	0.3825
ln (Category Inflow)	11596	-2.2606	-2.5884	1.1558
Turnover	11596	1.0557	0.7620	1.1887
12b-1 Expense	11596	0.0071	0.0008	0.1109
Minimum Required Investment (in thousands of dollars)	11596	51.2540	1.0000	407.4411
Performance Based Fee	11596	0.0038	-	-
Fee on Rival Performance	11596	0.0085	-	-

Panel B: Return and Volatility of the Median Equity Fund over the Sample Period

Year	Median Fund Return	Median Fund Return Volatility	Median Fund Return Gap	Median Fund Volatility of Return Gap
1994	-0.0144	0.0323	0.0161	0.0115
1995	0.2969	0.0250	0.0162	0.0120
1996	0.1898	0.0328	0.0163	0.0134
1997	0.2328	0.0468	0.0209	0.0132
1998	0.1277	0.0695	0.0000	0.0186
1999	0.2600	0.0482	-0.0281	0.0259
2000	-0.0743	0.0583	-0.0952	0.0308
2001	-0.1284	0.0614	-0.0015	0.0155
2002	-0.2134	0.0577	0.0126	0.0124
2003	0.3211	0.0384	0.0396	0.0069

Table 2. All Funds. Number of Funds in the Category vs. Incentives in Advisory Contract.

This table presents the estimates of the following equation.

$$H_{C,it} = \alpha + \beta C_{it} + \gamma F_{it} + \delta X_{it} + \varepsilon_{it}$$

Where H_C represents the ranking of the categories based on the number of funds, with the first category being the smallest category in terms of number of funds; and C represents the incentives contained in the advisory contract. The equation is estimated with Ordered-Probit regression. The 23 categories, according to the ICDI classification in CRSP database, are ranked each calendar year based on the average number of funds during the year. To infer the causal effect of C on H_C; C is first projected on a set of instruments Z as below:

$$C_{it} = \theta + \phi Z_{it} + \kappa F_{it} + \psi X_{it} + \nu_{it}$$

In panel A, C is the Coles' incentive rate (CIR); while in panel B, C is the weighted incentive rate (WIR), obtained by dividing the weighted average of fee rates by the first applicable fee rate. For funds with linear contracts, the values of CIR and WIR would be 0 and 1 respectively. Since Coles' incentive rate is right-censored at 0 and weighted incentive rate is right-censored at 1 in the sample, the first-stage estimates were obtained with a Tobit regression of C on the instruments and exogenous variables. The estimated values of C are then used in the second stage estimations that are reported below.

In the above equations, F represents the size of the family that the fund belongs to. In both panel A and panel B, we use the logarithm of family TNA as the proxy for the size of family in columns (1)-(3) and the logarithm of number of funds in the family as the proxy in columns (4)-(6). The vector X represents a set of control variables including size, new money inflow, age, turnover, return, volatility, 12b-1 expenses, minimum required investment, a dummy for whether the contract specifies a performance based fee and another dummy for fee based on rival performance. The instruments Z are the average size of investor accounts in the fund, calculated as the total net assets divided by the total number of shareholder accounts as reported by the mutual fund in NSAR filings, and the expense ratio of the fund.

All equations are estimated at annual frequency level and in a pooled regression framework, with adjustment of standard errors for clustering at the fund level (columns (2) and (5)) or at the fund-family level (columns (3) and (6)). Index funds are excluded from the analysis. The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero. The variables are defined in the appendix B and their summary statistics are given in table 1.

Table 2. Panel A. All Funds. Number of Funds in the Category vs. Incentives in Advisory Contract (CIR and EFR)

Dependent Variable :	Category Ranked on Number of Funds					
	(1)	(2)	(3)	(4)	(5)	(6)
Coles' Incentive Rate	-2.4432***	-2.4432***	-2.4432***	-2.2328***	-2.2328***	-2.2328***
	(-4.39)	(-3.33)	(-3.15)	(-4.27)	(-3.23)	(-3.05)
Effective Fee Rate	-2.7283***	-2.7283***	-2.7283***	-2.4880***	-2.4880***	-2.4880***
	(-5.17)	(-3.78)	(-3.59)	(-5.05)	(-3.67)	(-3.48)
ln (Family TNA)	-0.0913***	-0.0913***	-0.0913***			
	(-7.33)	(-5.16)	(-4.58)			
ln (No. of Funds in Family)				-0.1030**	-0.1030***	-0.1030***
				(-7.86)	(-5.10)	(-4.25)
ln (Category Inflow)	0.1275***	0.1275***	0.1275***	0.1151***	0.1151***	0.1151**
	(4.31)	(3.16)	(2.75)	(4.12)	(3.00)	(2.55)
ln (Fund TNA)	-0.1683***	-0.1683***	-0.1683***	-0.1780***	-0.1780***	-0.1780***
	(-4.46)	(-3.32)	(-3.18)	(-4.58)	(-3.40)	(-3.26)
New Money Inflow	-0.0015***	-0.0015***	-0.0015***	-0.0013***	-0.0013***	-0.0013***
	(-4.54)	(-3.48)	(-3.23)	(-4.33)	(-3.33)	(-3.08)
Age	-0.0277***	-0.0277***	-0.0277***	-0.0251***	-0.0251***	-0.0251**
	(-4.33)	(-3.18)	(-2.69)	(-4.19)	(-3.05)	(-2.56)
Turnover	-0.0013	-0.0013	-0.0013	-0.0079	-0.0079	-0.0079
	(-0.10)	(-0.07)	(-0.07)	(-0.62)	(-0.44)	(-0.40)
Fund Return	0.7527***	0.7527***	0.7527***	0.7052***	0.7052***	0.7052***
	(6.27)	(4.91)	(4.61)	(6.10)	(4.81)	(4.50)
Fund Return Volatility	26.4765***	26.4765***	26.4765***	25.4786***	25.4786***	25.4786***
	(10.96)	(7.97)	(7.49)	(11.15)	(8.08)	(7.57)
12b-1 Expense	0.2951**	0.2951	0.2951*	0.2288*	0.2288	0.2288
	(1.99)	(1.59)	(1.66)	(1.65)	(1.32)	(1.39)
Minimum Required Investment	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003
	(-1.28)	(-0.93)	(-0.98)	(-1.01)	(-0.73)	(-0.78)
Performance Based Fee	-0.5428***	-0.5428**	-0.5428*	-0.5151***	-0.5151*	-0.5151
	(-3.00)	(-2.02)	(-1.68)	(-2.83)	(-1.89)	(-1.56)
Fee on Rival Performance	0.0288	0.0288	0.0288	-0.0204	-0.0204	-0.0204
	(0.31)	(0.25)	(0.30)	(-0.22)	(-0.18)	(-0.21)
Clustered Standard Errors	None	Fund Level	Family Level	None	Fund Level	Family Level
Number of Observations	11410	11410	11410	11410	11410	11410
Pseudo R-square	2.53%	2.53%	2.53%	2.51%	2.51%	2.51%
First Stage Estimation						
Average Account Size	0.0070***	0.0070***	0.0070***	0.0072***	0.0072***	0.0072***
	(5.61)	(5.61)	(5.61)	(5.81)	(5.81)	(5.81)
Expense Ratio	-0.1318***	-0.1318***	-0.1318***	-0.1312***	-0.1312***	-0.1312***
	(-16.61)	(-16.61)	(-16.61)	(-16.53)	(-16.53)	(-16.53)
Pseudo R-square	10.06%	10.06%	10.06%	10.00%	10.00%	10.00%

Table 2. Panel B. All Funds. Number of Funds in the Category vs. Incentives in Advisory Contract (WIR and EFR)

Dependent Variable :	Category Ranked on Number of Funds					
	(1)	(2)	(3)	(4)	(5)	(6)
Weighted Incentive Rate	-5.5106***	-5.5106***	-5.5106***	-4.9045***	-4.9045***	-4.9045***
	(-4.42)	(-3.35)	(-3.14)	(-4.29)	(-3.25)	(-3.04)
Effective Fee Rate	-3.0860***	-3.0860***	-3.0860***	-2.7428***	-2.7428***	-2.7428***
	(-5.18)	(-3.80)	(-3.61)	(-5.08)	(-3.71)	(-3.51)
ln (Family TNA)	-0.1223***	-0.1223***	-0.1223***			
	(-6.27)	(-4.60)	(-4.19)			
ln (No. of Funds in Family)				-0.1329***	-0.1329***	-0.1329***
				(-6.72)	(-4.72)	(-4.08)
ln (Category Inflow)	0.1547***	0.1547***	0.1547***	0.1360***	0.1360***	0.1360***
	(4.42)	(3.27)	(2.92)	(4.24)	(3.12)	(2.72)
ln (Fund TNA)	-0.2013***	-0.2013***	-0.2013***	-0.2112***	-0.2112***	-0.2112***
	(-4.54)	(-3.39)	(-3.22)	(-4.61)	(-3.44)	(-3.27)
New Money Inflow	-0.0010***	-0.0010***	-0.0010***	-0.0009***	-0.0009***	-0.0009***
	(-4.46)	(-3.47)	(-3.19)	(-4.12)	(-3.26)	(-2.98)
Age	-0.0284***	-0.0284***	-0.0284***	-0.0249***	-0.0249***	-0.0249**
	(-4.35)	(-3.20)	(-2.72)	(-4.20)	(-3.06)	(-2.57)
Turnover	0.0265	0.0265	0.0265	0.0146	0.0146	0.0146
	(1.45)	(1.06)	(1.02)	(0.89)	(0.64)	(0.61)
Fund Return	0.7249***	0.7249***	0.7249***	0.6689***	0.6689***	0.6689***
	(6.49)	(5.12)	(4.74)	(6.33)	(5.04)	(4.64)
Fund Return Volatility	26.9802***	26.9802***	26.9802***	25.7130***	25.7130***	25.7130***
	(10.90)	(7.94)	(7.46)	(11.25)	(8.16)	(7.63)
12b-1 Expense	0.5034***	0.5034**	0.5034**	0.3998**	0.3998*	0.3998*
	(2.67)	(2.09)	(2.08)	(2.32)	(1.83)	(1.83)
Minimum Required Investment	1.17e-07	1.17e-07	1.17e-07	7.21e-06	7.21e-06	7.21e-06
	(0.01)	(0.00)	(0.00)	(0.35)	(0.25)	(0.29)
Performance Based Fee	-0.8863***	-0.8863***	-0.8863**	-0.8168***	-0.8168***	-0.8168**
	(-4.06)	(-2.83)	(-2.42)	(-3.83)	(-2.65)	(-2.22)
Fee on Rival Performance	-0.3487***	-0.3487**	-0.3487**	-0.3722***	-0.3722**	-0.3722**
	(-2.80)	(-2.20)	(-2.37)	(-2.94)	(-2.30)	(-2.47)
Clustered Standard Errors	None	Fund Level	Family Level	None	Fund Level	Family Level
Number of Observations	11596	11596	11596	11596	11596	11596
Pseudo R-square	2.53%	2.53%	2.53%	2.50%	2.50%	2.50%
First Stage Estimation						
Average Account Size	0.0033***	0.0033***	0.0033***	0.0034***	0.0034***	0.0034***
	(4.94)	(4.94)	(4.94)	(5.15)	(5.15)	(5.15)
Expense Ratio	-0.0675***	-0.0675***	-0.0675***	-0.0667***	-0.0667***	-0.0667***
	(-16.25)	(-16.25)	(-16.25)	(-16.01)	(-16.01)	(-16.01)
Pseudo R-square	19.42%	19.42%	19.42%	18.73%	18.73%	18.73%

Table 3. Equity Focused Funds. Number of Funds in the Category vs. Incentives in Advisory Contract.

This table presents the estimates of the following equation.

$$H_{C,it} = \alpha + \beta C_{it} + \gamma F_{it} + \delta X_{it} + \varepsilon_{it}$$

Where H_C represents the ranking of the categories based on the number of funds, with the first category being the smallest category in terms of number of funds; and C represents the incentives contained in the advisory contract. The equation is estimated with Ordered-Probit regression. The 23 categories, according to the ICDI classification in CRSP database, are ranked each calendar year based on the average number of funds during the year. The sample includes only those funds with at least 80% of assets invested in equities. To infer the causal effect of C on H_C; C is first projected on a set of instruments Z as below:

$$C_{it} = \theta + \phi Z_{it} + \kappa F_{it} + \psi X_{it} + \nu_{it}$$

In panel A, C is the Coles' incentive rate (CIR); while in panel B, C is the weighted incentive rate (WIR), obtained by dividing the weighted average of fee rates by the first applicable fee rate. For funds with linear contracts, the values of CIR and WIR would be 0 and 1 respectively. Since Coles' incentive rate is right-censored at 0 and weighted incentive rate is right-censored at 1 in the sample, the first-stage estimates were obtained with a Tobit regression of C on the instruments and exogenous variables. The estimated values of C are then used in the second stage estimations that are reported below.

In the above equations, F represents the size of the family that the fund belongs to. In both panel A and panel B, we use the logarithm of family TNA as the proxy for the size of family in columns (1)-(3) and the logarithm of number of funds in the family as the proxy in columns (4)-(6). The vector X represents a set of control variables including size, new money inflow, age, turnover, return, volatility, 12b-1 expenses, minimum required investment, a dummy for whether the contract specifies a performance based fee and another dummy for fee based on rival performance. The instruments Z are the average size of investor accounts in the fund, calculated as the total net assets divided by the total number of shareholder accounts as reported by the mutual fund in NSAR filings, and the expense ratio of the fund.

All equations are estimated at annual frequency level and in a pooled regression framework, with adjustment of standard errors for clustering at the fund level (columns (2) and (5)) or at the fund-family level (columns (3) and (6)). Index funds are excluded from the analysis. The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero. The variables are defined in the appendix B and their summary statistics are given in table 1.

Table 3. Panel A. Equity Focused Funds. Number of Funds in the Category vs. Incentives in Advisory Contract (CIR and EFR)

Dependent Variable :	Category Ranked on Number of Funds					
	(1)	(2)	(3)	(4)	(5)	(6)
Coles' Incentive Rate	-2.4038**	-2.4038*	-2.4038**	-2.4787**	-2.4787*	-2.4787**
	(-2.49)	(-1.95)	(-2.05)	(-2.50)	(-1.95)	(-2.05)
Effective Fee Rate	-3.4489***	-3.4489***	-3.4489***	-3.3186***	-3.3186***	-3.3186***
	(-3.48)	(-2.65)	(-2.95)	(-3.40)	(-2.58)	(-2.89)
ln (Family TNA)	-0.1624***	-0.1624***	-0.1624***			
	(-4.55)	(-3.50)	(-3.69)			
ln (No. of Funds in Family)				-0.2225***	-0.2225***	-0.2225***
				(-4.48)	(-3.39)	(-3.57)
ln (Category Inflow)	0.5207***	0.5207***	0.5207***	0.4837***	0.4837***	0.4837***
	(4.24)	(3.19)	(3.58)	(4.15)	(3.11)	(3.50)
ln (Fund TNA)	-0.1492**	-0.1492*	-0.1492*	-0.1921**	-0.1921*	-0.1921**
	(-2.21)	(-1.70)	(-1.84)	(-2.47)	(-1.91)	(-2.06)
New Money Inflow	-0.0177**	-0.0177**	-0.0177**	-0.0165**	-0.0165**	-0.0165**
	(-2.45)	(-2.22)	(-2.23)	(-2.31)	(-2.11)	(-2.09)
Age	-0.0234**	-0.0234	-0.0234	-0.0230*	-0.0230	-0.0230
	(-1.98)	(-1.54)	(-1.56)	(-1.94)	(-1.50)	(-1.53)
Turnover	0.1119***	0.1119***	0.1119***	0.0990***	0.0990***	0.0990**
	(5.21)	(3.49)	(2.58)	(4.88)	(3.24)	(2.38)
Fund Return	0.2988***	0.2988**	0.2988**	0.2552***	0.2552**	0.2552**
	(2.95)	(2.53)	(2.52)	(2.65)	(2.32)	(2.28)
Fund Return Volatility	8.7939***	8.7939***	8.7939***	9.0318***	9.0318***	9.0318***
	(9.21)	(7.40)	(6.92)	(9.15)	(7.33)	(6.87)
12b-1 Expense	0.7109**	0.7109	0.7109*	0.7490**	0.7490	0.7490*
	(2.00)	(1.57)	(1.67)	(2.02)	(1.59)	(1.69)
Minimum Required Investment	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(-1.42)	(-1.09)	(-1.23)	(-1.32)	(-1.01)	(-1.14)
Performance Based Fee	-0.4397**	-0.4397	-0.4397	-0.3877*	-0.3877	-0.3877
	(-2.07)	(-1.36)	(-1.52)	(-1.80)	(-1.17)	(-1.31)
Fee on Rival Performance	0.8435**	0.8435*	0.8435**	0.8123**	0.8123*	0.8123**
	(2.40)	(1.92)	(2.31)	(2.32)	(1.85)	(2.23)
Clustered Standard Errors	None	Fund Level	Family Level	None	Fund Level	Family Level
Number of Observations	4818	4818	4818	4818	4818	4818
Pseudo R-square	1.42%	1.42%	1.42%	1.33%	1.33%	1.33%
First Stage Estimation						
Average Account Size	0.0071***	0.0071***	0.0071***	0.0069***	0.0069***	0.0069***
	(3.76)	(3.76)	(3.76)	(3.69)	(3.69)	(3.69)
Expense Ratio	-0.1137***	-0.1137***	-0.1137***	-0.1117***	-0.1117***	-0.1117***
	(-9.95)	(-9.95)	(-9.95)	(-9.75)	(-9.75)	(-9.75)
Pseudo R-square	12.27%	12.27%	12.27%	11.95%	11.95%	11.95%

Table 3. Panel B. Equity Focused Funds. Number of Funds in the Category vs. Incentives in Advisory Contract (WIR and EFR)

Dependent Variable :	Category Ranked on Number of Funds					
	(1)	(2)	(3)	(4)	(5)	(6)
Weighted Incentive Rate	-4.6471**	-4.6471*	-4.6471**	-4.8561**	-4.8561*	-4.8561**
	(-2.40)	(-1.88)	(-1.98)	(-2.41)	(-1.88)	(-1.98)
Effective Fee Rate	-3.1974***	-3.1974***	-3.1974***	-3.0777***	-3.0777***	-3.0777***
	(-3.50)	(-2.66)	(-2.98)	(-3.42)	(-2.59)	(-2.92)
ln (Family TNA)	-0.1697***	-0.1697***	-0.1697***			
	(-4.05)	(-3.14)	(-3.30)			
ln (No. of Funds in Family)				-0.2254***	-0.2254***	-0.2254***
				(-4.08)	(-3.12)	(-3.27)
ln (Category Inflow)	0.4540***	0.4540***	0.4540***	0.4183***	0.4183***	0.4183***
	(4.54)	(3.37)	(3.83)	(4.47)	(3.30)	(3.76)
ln (Fund TNA)	-0.1583**	-0.1583*	-0.1583*	-0.2073**	-0.2073*	-0.2073**
	(-2.20)	(-1.70)	(-1.83)	(-2.43)	(-1.88)	(-2.02)
New Money Inflow	-0.0203**	-0.0203**	-0.0203**	-0.0192**	-0.0192**	-0.0192**
	(-2.55)	(-2.25)	(-2.29)	(-2.45)	(-2.17)	(-2.18)
Age	-0.0240**	-0.0240	-0.0240	-0.0238**	-0.0238	-0.0238
	(-2.00)	(-1.55)	(-1.58)	(-1.96)	(-1.52)	(-1.55)
Turnover	0.1231***	0.1231***	0.1231***	0.1082***	0.1082***	0.1082***
	(5.20)	(3.58)	(2.79)	(5.03)	(3.40)	(2.59)
Fund Return	0.1814**	0.1814**	0.1814*	0.1350*	0.1350	0.1350
	(2.26)	(2.16)	(1.90)	(1.70)	(1.64)	(1.42)
Fund Return Volatility	8.0458***	8.0458***	8.0458***	8.3038***	8.3038***	8.3038***
	(9.87)	(8.07)	(7.42)	(9.99)	(8.13)	(7.46)
12b-1 Expense	0.5890*	0.5890	0.5890	0.6303*	0.6303	0.6303
	(1.84)	(1.45)	(1.54)	(1.87)	(1.47)	(1.57)
Minimum Required Investment	-0.00004	-0.00004	-0.00004	-0.00003	-0.00003	-0.00003
	(-0.71)	(-0.54)	(-0.63)	(-0.53)	(-0.40)	(-0.47)
Performance Based Fee	-0.7020***	-0.7020**	-0.7020**	-0.6591***	-0.6591*	-0.6591**
	(-2.86)	(-1.96)	(-2.13)	(-2.68)	(-1.82)	(-2.00)
Fee on Rival Performance	0.1344	0.1344	0.1344	0.0907	0.0907	0.0907
	(0.64)	(0.52)	(0.62)	(0.43)	(0.35)	(0.41)
Clustered Standard Errors	None	Fund Level	Family Level	None	Fund Level	Family Level
Number of Observations	4885	4885	4885	4885	4885	4885
Pseudo R-square	1.40%	1.40%	1.40%	1.31%	1.31%	1.31%
First Stage Estimation						
Average Account Size	0.0034***	0.0034***	0.0034***	0.0033***	0.0033***	0.0033***
	(3.22)	(3.22)	(3.22)	(3.11)	(3.11)	(3.11)
Expense Ratio	-0.0519***	-0.0519***	-0.0519***	-0.0505***	-0.0505***	-0.0505***
	(-8.15)	(-8.15)	(-8.15)	(-7.88)	(-7.88)	(-7.88)
Pseudo R-square	19.92%	19.92%	19.92%	18.89%	18.89%	18.89%

Table 4. Univariate Differences in Mean Herding Measure, *UHM* (in percent).

The herding measure *UHM(i,t)*, for a given stock-quarter equals *|p(i,t)-E[p(i,t)]|-E|p(i,t)-E[p(i,t)]|*, where *p(i,t)* equals the proportion of funds trading stock *i* during quarter *t* that are buyers within a given category. The proxy used for *E[p(i,t)]* is the average of *p(i,t)*s of all stocks traded by mutual funds within a given category during quarter *t*. *E|p(i,t)-E[p(i,t)]|* is calculated under the null hypothesis of herding only by random chance. The sample of mutual funds includes only those that are matched with the NSAR database.

Presented in panel A are the values of *UHM*, which is *UHM(i,t)* averaged across all stock-quarters, traded at least by the number of funds indicated by the column heading. The numbers of stock-quarters are given in parentheses. The split between Low Fee Rate (LFR) and High Fee Rate (HFR) is made based on the median value of effective fee rates of each category. The last row of the panel represents the t-test of the hypothesis that UHM_{LFR} is equal to UHM_{HFR}.

Panel B presents the values of *UHM* for the 5 different categories (LG, AG, GI, BL and IE) separately, with at least 5 trades. The split between LFR and HFR is made based on the median value of effective fee rates for the particular category. The last row of the panel represents the t-test of the hypothesis that UHM_{LFR} is equal to UHM_{HFR}.

Note that the total number of stock-quarters summed across different categories differs from that for the full sample of funds. For example, one stock-quarter may be traded by two aggressive growth funds, two growth funds and one balanced fund. This stock-quarter will not enter in the calculation of *UHM* in any of the individual categories, but will be counted in the calculation of *UHM* for the entire sample with at least five trades. The Data section provides more details about the construction of the variables.

	Panel A				
	Number of Trades				
All Funds :	≥5	≥10	≥20	≥30	≥50
Mean	2.42	3.04	3.35	3.56	4.11
	(134626)	(97560)	(62015)	(43828)	(23993)
Median	1.27	1.70	1.98	2.17	2.71
Low Fee Rate Group (LFR)	3.06	4.15	6.02	7.73	10.34
	(44174)	(18566)	(5199)	(1999)	(438)
High Fee Rate Group (HFR)	1.40	2.80	4.33	5.41	7.55
	(44174)	(18566)	(5199)	(1999)	(438)
t-stat of H0: $(HM_{LFR} - HM_{HFR}) = 0$	27.69	17.41	13.65	13.38	9.08

	Panel B				
	Number of Trades ≥ 5				
Fund Category	Long-Term Growth	Aggressive Growth	International Equity	Growth and Income	Balanced
Mean	2.21	0.82	2.75	1.68	1.22
	(52599)	(91156)	(4543)	(37125)	(14155)
Low Fee Rate Group (LFR)	2.54	1.04	3.42	2.14	2.07
	(23687)	(29905)	(1241)	(15185)	(5555)
High Fee Rate Group (HFR)	0.87	0.38	1.79	0.19	0.88
	(23687)	(29905)	(1241)	(15185)	(5555)
t-stat of H0: $(HM_{LFR} - HM_{HFR}) = 0$	18.01	7.28	3.45	18.89	5.22

Table 5. Stock Herding vs. Incentives in the Advisory Contract.

This table presents the estimates of the following equation.

$$H_{S,it} = \alpha_H + \beta_H C_{it} + \gamma_H F_{it} + \delta_H X_{H,it} + \nu_{H,it}$$

H_S represents the stock herding measure for each fund, similar to the fund herding measure (FHM) in Grinblatt, Titman and Wermers (1995). It is calculated at quarterly frequency, which is then averaged across the 4 quarters in a calendar year for the measure of stock herding used in columns (1)-(4). In column (5), we estimate the above equation in a Fama-Macbeth regression framework (time-series average of cross-sectional estimates) for which we use the stock herding measure at quarterly frequency.

C represents the incentives in the advisory contract. In panel A, Coles' incentive rate (CIR) and Effective fee rate (EFR) are used as the measure of incentives, while in panel B, Weighted incentive rate (WIR) and Effective fee rate (EFR) are the measure of incentives. F is the size of the fund-family in terms of logarithm of total TNA and X represents other control variables.

The equation is estimated using a two-step procedure. Since CIR is right-censored at 0 and WIR is right-censored at 1 in the sample, Tobit regressions of concavity regressed on the set of instruments and controls variables is used to calculate the estimated values of CIR and WIR. The average account size and the expense ratio are used as instruments in the first stage regressions. The estimated values of CIR and WIR are then used in the second stage estimations that are reported below.

In both panels, column (1) presents the results of estimating the regression equation in a pooled regression framework. In columns (2), (3) and (4), we adjust the standard errors of the estimates to allow for clustering at the fund level, at the family level and at the year level, respectively. Column (5) presents the estimates of panel between-effect regression, where time-series average of the dependent variable is regressed on the time-series averages of the independent variables. Column (6) presents the results of estimating the above equation in a Fama-Macbeth framework. The Fama-Macbeth estimation is run at quarterly frequency. We take the estimates from a quarter only if we have more than 50 observations in the cross-sectional regression. We use only the funds belonging to one of the following five categories, according to ICDI classification in CRSP database, in our analysis: LG, AG, GI, BL and IE. Index funds are excluded from the analysis. All specifications include category dummies.

The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Table 5. Panel A. Stock Herding vs. Incentives in the Advisory Contract (CIR and EFR)

Dependent Variable :	Stock Herding (H_S)					
	Pooled Regression	Clustered Regression at Fund Level	Clustered Regression at Family Level	Clustered Regression at Year Level	Between Effect Regression	Fama-Macbeth Regression
	(1)	(2)	(3)	(4)	(5)	(6)
Coles' Incentive Rate (CIR)	-2.6476***	-2.6476**	-2.6476**	-2.6476**	-3.3762***	-1.1669**
	(-3.02)	(-2.53)	(-2.45)	(-2.42)	(-4.03)	(-2.63)
Effective Fee Rate (EFR)	-2.6084***	-2.6084***	-2.6084***	-2.6084**	-3.2065***	-1.4902***
	(-3.49)	(-2.82)	(-2.65)	(-2.77)	(-4.35)	(-3.65)
ln (Family TNA)	-0.1296***	-0.1296***	-0.1296***	-0.1296**	-0.1586***	-0.0638***
	(-3.50)	(-2.90)	(-2.76)	(-2.82)	(-4.40)	(-3.28)
ln (Fund TNA)	-0.1646***	-0.1646***	-0.1646***	-0.1646**	-0.2093***	-0.0798***
	(-3.32)	(-2.73)	(-2.61)	(-2.75)	(-4.38)	(-3.10)
New Money Inflow	-0.0013	-0.0013	-0.0013	-0.0013	-0.0020	0.0246***
	(-0.88)	(-0.80)	(-0.75)	(-0.96)	(-0.72)	(2.72)
Age	-0.0251***	-0.0251**	-0.0251**	-0.0251**	-0.0313***	-0.0126***
	(-2.96)	(-2.46)	(-2.36)	(-2.41)	(-3.87)	(-2.88)
Turnover	0.0008***	0.0008**	0.0008**	0.0008*	0.0011***	-0.0100***
	(2.64)	(2.20)	(2.10)	(2.09)	(2.86)	(-3.49)
Prior Year Return	0.7001***	0.7001***	0.7001***	0.7001***	0.9166***	0.4007***
	(5.14)	(4.25)	(4.07)	(5.16)	(6.68)	(4.17)
Prior Year Volatility	4.1963***	4.1963***	4.1963***	4.1963**	5.0035***	2.2491***
	(3.78)	(3.17)	(3.02)	(2.96)	(4.52)	(2.79)
12b-1 Expense	-0.2956***	-0.2956**	-0.2956**	-0.2956**	-0.3065	-1.6085*
	(-2.61)	(-2.50)	(-2.35)	(-2.50)	(-1.33)	(-1.74)
Minimum Required Investment	-0.0002***	-0.0002***	-0.0002**	-0.0002**	-0.0003***	-0.0003*
	(-3.52)	(-2.93)	(-2.33)	(-2.27)	(-4.57)	(-1.78)
Performance Based Fee	0.4213***	0.4213**	0.4213**	0.4213**	0.6091***	0.0619
	(2.63)	(2.27)	(2.14)	(2.23)	(3.34)	(1.27)
Fee on Rival Performance	1.2935***	1.2935**	1.2935**	1.2935*	1.6929***	0.2296
	(2.68)	(2.24)	(2.20)	(2.19)	(3.61)	(1.12)
Intercept	8.7403***	8.7403***	8.7403***	8.7403**	10.8936***	4.4387***
	(3.38)	(2.77)	(2.64)	(2.74)	(4.34)	(3.26)
Category Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	4097	4097	4097	4097	1641	4097 †
R-square	17.77%	17.77%	17.77%	17.77%	24.55%	-

† - Based on 36 cross-sectional regressions.

Table 5. Panel B. Stock Herding vs. Incentives in the Advisory Contract (WIR and EFR)

Dependent Variable :	Stock Herding (H_S)					
	Pooled Regression	Clustered Regression at Fund Level	Clustered Regression at Family Level	Clustered Regression at Year Level	Between Effect Regression	Fama-Macbeth Regression
	(1)	(2)	(3)	(4)	(5)	(6)
Weighted Incentive Rate (WIR)	-5.2638***	-5.2638**	-5.2638**	-5.2638**	-6.7776***	-2.2739**
	(-2.95)	(-2.48)	(-2.40)	(-2.41)	(-3.97)	(-2.51)
Effective Fee Rate (EFR)	-2.2358***	-2.2358***	-2.2358***	-2.2358**	-2.7582***	-1.2991***
	(-3.50)	(-2.82)	(-2.64)	(-2.85)	(-4.34)	(-3.67)
ln (Family TNA)	-0.1205***	-0.1205***	-0.1205***	-0.1205**	-0.1485***	-0.0584***
	(-3.45)	(-2.87)	(-2.74)	(-2.84)	(-4.35)	(-3.17)
ln (Fund TNA)	-0.1721***	-0.1721***	-0.1721**	-0.1721**	-0.2202***	-0.0832***
	(-3.25)	(-2.69)	(-2.57)	(-2.74)	(-4.30)	(-3.02)
New Money Inflow	-0.0026	-0.0026	-0.0026	-0.0026	-0.0036	0.0242**
	(-1.40)	(-1.24)	(-1.18)	(-1.43)	(-1.23)	(2.56)
Age	-0.0249***	-0.0249**	-0.0249**	-0.0249**	-0.0312***	-0.0122***
	(-2.94)	(-2.45)	(-2.35)	(-2.44)	(-3.86)	(-2.79)
Turnover	0.0011***	0.0011**	0.0011**	0.0011*	0.0014***	-0.0107***
	(2.66)	(2.23)	(2.14)	(2.15)	(3.14)	(-3.90)
Prior Year Return	0.6021***	0.6021***	0.6021***	0.6021***	0.7960***	0.3590***
	(5.63)	(4.67)	(4.46)	(5.73)	(7.16)	(4.35)
Prior Year Volatility	3.6793***	3.6793***	3.6793***	3.6793**	4.4045***	2.0065***
	(3.83)	(3.22)	(3.05)	(3.02)	(4.52)	(2.68)
12b-1 Expense	-0.2556**	-0.2556**	-0.2556**	-0.2556**	-0.2592	-1.5488*
	(-2.36)	(-2.31)	(-2.16)	(-2.44)	(-1.13)	(-1.71)
Minimum Required Investment	-0.0001***	-0.0001***	-0.0001**	-0.0001*	-0.0002***	-0.0002
	(-3.40)	(-2.88)	(-1.98)	(-2.00)	(-4.41)	(-1.56)
Performance Based Fee	0.3431**	0.3431**	0.3431**	0.3431*	0.5141***	0.0401
	(2.44)	(2.13)	(1.99)	(2.00)	(3.07)	(0.96)
Fee on Rival Performance	0.2245	0.2245	0.2245	0.2245	0.3283*	0.0756
	(1.51)	(1.27)	(1.25)	(1.43)	(1.93)	(1.06)
Intercept	13.8779***	13.8779***	13.8779**	13.8779**	17.6021***	6.5955***
	(3.17)	(2.63)	(2.53)	(2.61)	(4.17)	(2.91)
Category Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	4166	4166	4166	4166	1654	4166 ‡
R-square	17.83%	17.83%	17.83%	17.83%	24.63%	-

‡ - Based on 36 cross-sectional regressions.

Table 6. Fund Return Volatility vs. Incentives in the Advisory Contract.

This table presents the estimates of the following equation.

$$\sigma_{it} = \alpha_{R,1} + \beta_{R,1} C_{it} + \gamma_{R,1} F_{it} + \phi_{R,1} X_{R,it} + \nu_{R,1,it}$$

σ represents the volatility of return the fund over the 12 months in a calendar year. C represents the incentives in the advisory contract. In panel A, Coles' incentive rate (CIR) and Effective fee rate (EFR) are used as the measure of incentives, while in panel B, Weighted incentive rate (WIR) and Effective fee rate (EFR) are the measure of incentives. F is the size of the fund-family in terms of logarithm of total TNA and X represents other control variables.

The equation is estimated using a two-step procedure. Since CIR is right-censored at 0 and WIR is right-censored at 1 in the sample, Tobit regressions of concavity regressed on the set of instruments and controls variables is used to calculate the estimated values of CIR and WIR. The average account size and the expense ratio are used as instruments in the first stage regressions. The estimated values of CIR and WIR are then used in the second stage estimations that are reported below.

In both panels, column (1) presents the results of estimating the regression equation in a pooled regression framework. In columns (2), (3) and (4), we adjust the standard errors of the estimates to allow for clustering at the fund level, at the family level and at the year level, respectively. Column (5) presents the estimates of panel between-effect regression, where time-series average of the dependent variable is regressed on the time-series averages of the independent variables. We use only the funds belonging to one of the following five categories, according to ICDI classification in CRSP database, in our analysis: LG, AG, GI, BL and IE and with at least 80% of assets invested in equities. Index funds are excluded from the analysis. All specifications include category dummies.

The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Table 6. Panel A. Fund Return Volatility vs. Incentives in the Advisory Contract (CIR and EFR)

Dependent Variable :	Return Volatility				
	Pooled Regression	Clustered Regression at Fund Level	Clustered Regression at Family Level	Clustered Regression at Year Level	Between Effect Regression
	(1)	(2)	(3)	(4)	(5)
Coles' Incentive Rate (CIR)	0.0545***	0.0545**	0.0545***	0.0545***	0.0500**
	(2.91)	(1.98)	(3.16)	(3.40)	(2.03)
Effective Fee Rate (EFR)	0.1056***	0.1056**	0.1056***	0.1056***	0.1108***
	(3.91)	(2.44)	(5.42)	(4.13)	(5.91)
ln (Family TNA)	0.0031***	0.0031*	0.0031***	0.0031**	0.0031***
	(2.94)	(1.95)	(3.60)	(3.03)	(3.08)
ln (Fund TNA)	0.0040***	0.0040**	0.0040***	0.0040***	0.0037***
	(3.45)	(2.21)	(4.06)	(3.96)	(3.23)
New Money Inflow	0.00004***	0.00004**	0.00004***	0.00004***	0.00004*
	(3.74)	(2.54)	(4.12)	(4.18)	(1.72)
Age	0.0006**	0.0006*	0.0006***	0.0006***	0.0006**
	(2.57)	(1.66)	(2.79)	(3.41)	(2.30)
Turnover	-0.00001**	-0.00001*	-0.00001**	-0.00001**	-0.00003
	(-1.97)	(-1.73)	(-2.43)	(-2.74)	(-1.01)
12b-1 Expense	0.0024	0.0024	0.0024	0.0024	0.0065
	(1.06)	(0.93)	(1.33)	(1.45)	(0.67)
Minimum Required Investment	8.79e-06***	8.79e-06**	8.79e-06***	8.79e-06***	9.07e-06***
	(3.46)	(2.24)	(4.30)	(3.98)	(3.49)
Performance Based Fee	-0.0084**	-0.0084**	-0.0084**	-0.0084*	-0.0039
	(-2.39)	(-2.01)	(-2.15)	(-2.23)	(-0.48)
Fee on Rival Performance	-0.0183***	-0.0183**	-0.0183***	-0.0183**	-0.0173*
	(-3.00)	(-2.23)	(-3.00)	(-3.04)	(-1.67)
Median Fund Return	-0.0099***	-0.0099**	-0.0099***	-0.0099	-0.0075
	(-3.55)	(-2.56)	(-3.34)	(-0.94)	(-1.50)
Median Fund Volatility	0.8513***	0.8513***	0.8513***	0.8513***	0.9331***
	(9.79)	(6.63)	(11.11)	(5.61)	(7.79)
Intercept	-0.2425***	-0.2425**	-0.2425***	-0.2425***	-0.2470***
	(-3.49)	(-2.23)	(-4.47)	(-3.82)	(-4.03)
Category Dummies	Yes	Yes	Yes	Yes	Yes
Number of Observations	4176	4176	4176	4176	1714
R-square	35.71%	35.71%	35.71%	35.71%	34.14%

Table 6. Panel B. Fund Return Volatility vs. Incentives in the Advisory Contract (WIR and EFR)

Dependent Variable :	Return Volatility				
	Pooled Regression	Clustered Regression at Fund Level	Clustered Regression at Family Level	Clustered Regression at Year Level	Between Effect Regression
	(1)	(2)	(3)	(4)	(5)
Weighted Incentive Rate (WIR)	0.1150***	0.1150*	0.1150***	0.1150***	0.1030*
	(2.78)	(1.90)	(2.93)	(3.32)	(1.83)
Effective Fee Rate (EFR)	0.1068***	0.1068**	0.1068***	0.1068***	0.1105***
	(3.82)	(2.39)	(5.04)	(4.16)	(5.19)
ln (Family TNA)	0.0034***	0.0034*	0.0034***	0.0034**	0.0033***
	(2.83)	(1.88)	(3.27)	(3.05)	(2.60)
ln (Fund TNA)	0.0047***	0.0047**	0.0047***	0.0047***	0.0043***
	(3.31)	(2.14)	(3.74)	(3.99)	(2.82)
New Money Inflow	0.0001***	0.0001**	0.0001***	0.0001***	0.00004*
	(3.52)	(2.40)	(3.76)	(4.14)	(1.72)
Age	0.0008**	0.0008*	0.0008***	0.0008***	0.0008**
	(2.57)	(1.68)	(2.75)	(3.41)	(2.14)
Turnover	-0.00001*	-0.00001*	-0.00001**	-0.00001**	-0.00003
	(-1.88)	(-1.66)	(-2.33)	(-2.58)	(-0.96)
12b-1 Expense	0.0022	0.0022	0.0022	0.0022	0.0060
	(0.96)	(0.84)	(1.21)	(1.26)	(0.62)
Minimum Required Investment	7.74e-06***	7.74e-06**	7.74e-06***	7.74e-06***	8.00e-06***
	(3.43)	(2.21)	(4.14)	(4.03)	(3.40)
Performance Based Fee	-0.0070**	-0.0070*	-0.0070*	-0.0070*	-0.0026
	(-2.10)	(-1.81)	(-1.88)	(-2.05)	(-0.33)
Fee on Rival Performance	-0.0012	-0.0012	-0.0012	-0.0012	-0.0013
	(-0.39)	(-0.37)	(-0.37)	(-0.47)	(-0.20)
Median Fund Return	-0.0065***	-0.0065**	-0.0065***	-0.0065	-0.0039
	(-3.02)	(-2.49)	(-2.60)	(-0.60)	(-0.82)
Median Fund Volatility	0.8383***	0.8383***	0.8383***	0.8383***	0.9337***
	(8.80)	(5.97)	(9.63)	(5.43)	(7.04)
Intercept	-0.3856***	-0.3856**	-0.3856***	-0.3856***	-0.3722***
	(-3.17)	(-2.09)	(-3.65)	(-3.70)	(-2.74)
Category Dummies	Yes	Yes	Yes	Yes	Yes
Number of Observations	4235	4235	4235	4235	1723
R-square	36.03%	36.03%	36.03%	36.03%	34.22%

Table 7. Mutual Fund Tournaments vs. Incentives in the Advisory Contract.

This table presents the estimates of the following equation.

$$\Delta\sigma_{it} = \alpha_{R,2} + \beta_{R,2} C_{it} + \gamma_{R,2} F_{it} + \theta_{R,2} Rank_{it} + \delta_{R,2} \sigma_{it}^{(1)} + \psi\Delta\sigma_{med,t} + \phi_{R,2} X_{R,it} + \nu_{R,2,it}$$

$\Delta\sigma$ represents the change in return volatility from the first semester to the second semester in a calendar year. C represents the incentives in the advisory contract. In panel A, Coles' incentive rate (CIR) and Effective fee rate (EFR) are used as the measure of incentives, while in panel B, Weighted incentive rate (WIR) and Effective fee rate (EFR) are the measure of incentives. F is the size of the fund-family in terms of logarithm of total TNA and X represents other control variables. *Rank* is the rank of the fund within its category based on the return in the first six months of the year. It is normalised between 0 and 1, with the fund having the highest return being ranked 1. $\sigma^{(1)}$ represents the return volatility of the fund in the first six months of the calendar year, while $\Delta\sigma_{\text{med}}$ represents the median value of change in return volatility from the first semester to the second semester within the category that the fund belongs to.

The equation is estimated using a two-step procedure. Since CIR is right-censored at 0 and WIR is right-censored at 1 in the sample, Tobit regressions of concavity regressed on the set of instruments and controls variables is used to calculate the estimated values of CIR and WIR. The average account size and the expense ratio are used as instruments in the first stage regressions. The estimated values of CIR and WIR are then used in the second stage estimations that are reported below.

In both panels, column (1) presents the results of estimating the regression equation in a pooled regression framework. In columns (2), (3) and (4), we adjust the standard errors of the estimates to allow for clustering at the fund level, at the family level and at the year level, respectively. Column (5) presents the estimates of panel between-effect regression, where time-series average of the dependent variable is regressed on the time-series averages of the independent variables. We use only the funds belonging to one of the following five categories, according to ICDI classification in CRSP database, in our analysis: LG, AG, GI, BL and IE and with at least 80% of assets invested in equities. Index funds are excluded from the analysis. All specifications include category dummies.

The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Table 7. Panel A. Mutual Fund Tournaments vs. Incentives in the Advisory Contract (CIR and EFR)

Dependent Variable :	Change in Return Volatility				
	Pooled Regression	Clustered Regression at Fund Level	Clustered Regression at Family Level	Clustered Regression at Year Level	Between Effect Regression
	(1)	(2)	(3)	(4)	(5)
Coles' Incentive Rate (CIR)	0.0102**	0.0102**	0.0102**	0.0102**	0.0105**
	(2.34)	(2.27)	(2.02)	(2.61)	(2.15)
Effective Fee Rate (EFR)	0.0087***	0.0087***	0.0087***	0.0087*	0.0067***
	(4.03)	(4.05)	(3.56)	(2.14)	(2.66)
ln (Family TNA)	0.0005***	0.0005***	0.0005***	0.0005*	0.0005***
	(3.27)	(3.18)	(2.85)	(2.20)	(2.69)
Fund Rank in Category	0.0045***	0.0045***	0.0045***	0.0045	0.0060***
	(4.39)	(4.39)	(3.92)	(1.40)	(4.49)
Fund Volatility in First Period	-0.2883***	-0.2883***	-0.2883***	-0.2883***	-0.2182***
	(-20.09)	(-20.63)	(-16.68)	(-12.37)	(-18.30)
Category Median Value of Change in Volatility	0.8815***	0.8815***	0.8815***	0.8815***	0.8809***
	(81.26)	(82.79)	(73.90)	(30.66)	(43.96)
ln (Fund TNA)	0.0004**	0.0004**	0.0004*	0.0004**	0.0004*
	(1.99)	(1.96)	(1.79)	(2.37)	(1.77)
New Money Inflow	6.46e-06*	6.46e-06*	6.46e-06**	6.46e-06**	7.98e-06
	(1.87)	(1.86)	(2.34)	(2.71)	(0.75)
Age	0.0001	0.0001	0.0001	0.0001	0.0001
	(1.20)	(1.17)	(1.04)	(1.20)	(0.93)
Turnover	0.00001*	0.00001*	0.00001**	0.00001*	0.00002
	(1.68)	(1.81)	(2.34)	(1.87)	(1.11)
12b-1 Expense	-0.0040*	-0.0040*	-0.0040**	-0.0040*	-0.0064
	(-1.71)	(-1.85)	(-2.39)	(-1.85)	(-1.28)
Minimum Required Investment	1.37e-06***	1.37e-06***	1.37e-06***	1.37e-06**	1.37e-06*
	(2.65)	(2.82)	(2.78)	(2.42)	(1.95)
Performance Based Fee	-0.0058**	-0.0058**	-0.0058**	-0.0058	-0.0051
	(-2.20)	(-2.22)	(-2.28)	(-1.73)	(-1.31)
Fee on Rival Performance	-0.0029	-0.0029	-0.0029	-0.0029	-0.0029
	(-0.99)	(-0.98)	(-0.81)	(-1.49)	(-0.78)
Intercept	-0.0182**	-0.0182**	-0.0182*	-0.0182	-0.0190**
	(-2.20)	(-2.21)	(-1.87)	(-1.66)	(-1.99)
Category Dummies	Yes	Yes	Yes	Yes	Yes
Number of Observations	4072	4072	4072	4072	1686
R-square	69.71%	69.71%	69.71%	69.71%	64.38%

Table 7. Panel B. Mutual Fund Tournaments vs. Incentives in the Advisory Contract (WIR and EFR)

Dependent Variable :	Change in Return Volatility				
	Pooled Regression	Clustered Regression at Fund Level	Clustered Regression at Family Level	Clustered Regression at Year Level	Between Effect Regression
	(1)	(2)	(3)	(4)	(5)
Weighted Incentive Rate (WIR)	0.0229**	0.0229**	0.0229**	0.0229**	0.0237**
	(2.27)	(2.21)	(1.97)	(2.54)	(2.12)
Effective Fee Rate (EFR)	0.0100***	0.0100***	0.0100***	0.0100*	0.0078***
	(3.87)	(3.91)	(3.34)	(2.25)	(2.58)
ln (Family TNA)	0.0007***	0.0007***	0.0007***	0.0007**	0.0006***
	(3.12)	(3.03)	(2.67)	(2.33)	(2.66)
Fund Rank in Category	0.0046***	0.0046***	0.0046***	0.0046	0.0063***
	(4.66)	(4.63)	(4.15)	(1.48)	(4.76)
Fund Volatility in First Period	-0.2896***	-0.2896***	-0.2896***	-0.2896***	-0.2181***
	(-20.02)	(-20.54)	(-16.69)	(-12.23)	(-17.94)
Category Median Value of Change in Volatility	0.8780***	0.8780***	0.8780***	0.8780***	0.8758***
	(81.34)	(81.67)	(71.63)	(30.08)	(43.94)
ln (Fund TNA)	0.0005**	0.0005**	0.0005*	0.0005**	0.0005*
	(2.17)	(2.12)	(1.94)	(2.56)	(1.74)
New Money Inflow	7.45e-06**	7.45e-06**	7.45e-06**	7.45e-06**	8.99e-06
	(1.97)	(1.96)	(2.29)	(2.82)	(0.84)
Age	0.0001	0.0001	0.0001	0.0001	0.0001
	(1.35)	(1.32)	(1.18)	(1.48)	(1.20)
Turnover	0.00001*	0.00001*	0.00001**	0.00001*	0.00002
	(1.66)	(1.80)	(2.29)	(1.87)	(1.11)
12b-1 Expense	-0.0041*	-0.0041*	-0.0041**	-0.0041*	-0.0065
	(-1.72)	(-1.86)	(-2.38)	(-1.88)	(-1.29)
Minimum Required Investment	1.23e-06**	1.23e-06***	1.23e-06***	1.23e-06**	1.20e-06*
	(2.53)	(2.72)	(2.75)	(2.34)	(1.79)
Performance Based Fee	-0.0051**	-0.0051**	-0.0051**	-0.0051	-0.0044
	(-1.97)	(-2.00)	(-2.05)	(-1.57)	(-1.15)
Fee on Rival Performance	-0.0026	-0.0026	-0.0026	-0.0026	-0.0027
	(-0.89)	(-0.89)	(-0.74)	(-1.35)	(-0.74)
Intercept	-0.0486**	-0.0486**	-0.0486**	-0.0486*	-0.0497**
	(-2.31)	(-2.26)	(-1.98)	(-2.21)	(-2.09)
Category Dummies	Yes	Yes	Yes	Yes	Yes
Number of Observations	4111	4111	4111	4111	1690
R-square	69.55%	69.55%	69.55%	69.55%	64.16%

Table 8. Fund Survival and Incentives

This table presents the results from survival analysis of mutual funds applying Cox semi-parametric hazard rate model and parametric proportional hazard model on fund closure data. The Cox regression model estimates the hazard rate for fund i as

$$h(t|Z_i) = h_0(t)\,exp(Z_i\beta)$$

where $h(t)$ is the hazard rate, the fraction of mutual funds alive prior to time t that die at t, Z is the vector of explanatory variables that includes incentive (C), size of the fund-family (F) and other control variables (X) as defined in the previous table; and β are the maximum likelihood estimates of the coefficients. $h_0(t)$ is referred to as the baseline hazard rate. The Cox model does not impose any parameterization on the baseline hazard rate and leaves it unestimated. The model also does not make any assumption about the shape of the hazard over time. The only assumption is that the shape of the hazard is the same for all the funds. In the parametric proportional hazard model that we estimate, $h_0(t)$ is specified to have the following functional form: $h_0(t) = \exp(\psi)$ where ψ is a parameter to be estimated. In panel A, Coles' incentive rate (CIR) is used as the measure of incentive, while in panel B, Weighted incentive rate (WIR) is the measure of incentive; with the Effective fee rate (EFR) being the level of fees in both panels.

The equation is estimated using a two-step procedure. Since CIR is right-censored at 0 and WIR is right-censored at 1 in the sample, Tobit regressions of concavity regressed on the set of instruments and controls variables is used to calculate the estimated values of CIR and WIR. The average account size and the expense ratio are used as instruments in the first stage regressions. The estimated values of CIR and WIR are then used in the second stage estimations that are reported below.

In both panels, columns (1) and (3) present the results of estimating the regression equation in a panel regression framework with the standard errors being adjusted for clustering at the fund level. In columns (2) and (4), we adjust the standard errors of the estimates to allow for clustering at the fund-family level. We use only the funds belonging to one of the following three categories, according to ICDI classification in CRSP database, in our analysis: LG, AG, and GI and with at least 80% of assets invested in equities. Index funds are excluded from the analysis. All specifications include year dummies to control for time fixed effects and category dummies to control for category fixed effects.

The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Table 8. Panel A. Fund Survival and Incentives (Coles' Incentive Rate)

	Cox Proportional Hazard Model		Parametric (Exponential) Hazard Model	
	(1)	(2)	(3)	(4)
Coles' Incentive Rate (CIR)	1.0754***	1.0754***	1.0846***	1.0846***
	(3.75)	(3.53)	(3.77)	(3.44)
Effective Fee Rate (EFR)	1.0484***	1.0484**	1.0526***	1.0526**
	(2.68)	(2.26)	(2.85)	(2.37)
ln (Family TNA)	1.7277***	1.7277***	1.7500***	1.7500***
	(4.97)	(4.43)	(4.83)	(4.23)
ln (Fund TNA)	0.6479***	0.6479***	0.6837***	0.6837***
	(-7.45)	(-6.70)	(-6.14)	(-5.57)
New Money Inflow	0.7399	0.7399	0.6907	0.6907
	(-1.22)	(-1.22)	(-1.24)	(-1.23)
Fund Age	1.0807***	1.0807***	1.0935***	1.0935***
	(3.16)	(3.03)	(3.44)	(3.23)
Lagged Fund Return Volatility	1.0370	1.0370	1.0457	1.0457
	(0.93)	(0.85)	(1.16)	(1.10)
Lagged Fund Alpha	0.5544***	0.5544***	0.5941***	0.5941***
	(-5.55)	(-5.27)	(-4.25)	(-3.77)
Turnover Ratio	0.8807*	0.8807	0.8313**	0.8313**
	(-1.93)	(-1.53)	(-2.49)	(-1.99)
12b-1 Expense	1.2037**	1.2037**	1.2307***	1.2307***
	(2.43)	(2.50)	(2.71)	(2.70)
Minimum Required Investment	1.0004***	1.0004***	1.0004**	1.0004**
	(2.83)	(3.04)	(2.27)	(2.40)
Performance Based Fee	0.0625**	0.0625**	0.0306***	0.0306**
	(-2.38)	(-2.17)	(-2.61)	(-2.34)
Fee on Rival Performance	0.0988**	0.0988*	0.0780**	0.0780*
	(-2.19)	(-1.86)	(-2.24)	(-1.93)
Year Dummies	Yes	Yes	Yes	Yes
Category Dummies	Yes	Yes	Yes	Yes
Clustering	Fund Level	Family Level	Fund Level	Family Level
Number of Observations	3010	3010	3010	3010

Table 8. Panel B. Fund Survival and Incentives (Weighted Incentive Rate)

	Cox Proportional Hazard Model		Parametric (Exponential) Hazard Model	
	(1)	(2)	(3)	(4)
Weighted Incentive Rate (WIR)	1.1449***	1.1449***	1.1596***	1.1596***
	(3.89)	(3.64)	(3.81)	(3.46)
Effective Fee Rate (EFR)	1.0511***	1.0511**	1.0548***	1.0548**
	(2.77)	(2.36)	(2.88)	(2.42)
ln (Family TNA)	1.7803***	1.7803***	1.8087***	1.8087***
	(4.97)	(4.44)	(4.81)	(4.23)
ln (Fund TNA)	0.6788***	0.6788***	0.7098***	0.7098***
	(-6.21)	(-5.62)	(-5.17)	(-4.63)
New Money Inflow	0.7253	0.7253	0.6822	0.6822
	(-1.29)	(-1.29)	(-1.30)	(-1.29)
Fund Age	1.0843***	1.0843***	1.0984***	1.0984***
	(3.15)	(3.06)	(3.47)	(3.26)
Lagged Fund Return Volatility	1.1216***	1.1216**	1.1381***	1.1381***
	(2.58)	(2.37)	(2.96)	(2.74)
Lagged Fund Alpha	0.5740***	0.5740***	0.6143***	0.6143***
	(-5.30)	(-5.11)	(-4.09)	(-3.66)
Turnover Ratio	0.8381**	0.8381**	0.7935***	0.7935**
	(-2.47)	(-1.96)	(-2.90)	(-2.33)
12b-1 Expense	1.0017**	1.0017***	1.0019***	1.0019***
	(2.48)	(2.58)	(2.66)	(2.67)
Minimum Required Investment	1.0004**	1.0004***	1.0003**	1.0003**
	(2.49)	(2.76)	(1.96)	(2.12)
Performance Based Fee	0.0928**	0.0928**	0.0517**	0.0517**
	(-2.24)	(-2.04)	(-2.43)	(-2.18)
Fee on Rival Performance	0.1504**	0.1504*	0.1332**	0.1332*
	(-2.04)	(-1.69)	(-2.02)	(-1.70)
Year Dummies	Yes	Yes	Yes	Yes
Category Dummies	Yes	Yes	Yes	Yes
Clustering	Fund Level	Family Level	Fund Level	Family Level
Number of Observations	3064	3064	3064	3064

Table 9. Fund Performance and Incentives: Multivariate Analysis

This table presents the estimates of the following equation.

$$R_{it} = \alpha_R + \beta_R C_{it} + \gamma_R F_{it} + \phi_R X_{R,it} + \nu_{R,it}$$

R_{it} represents the risk-adjusted return of the fund for a calendar year, defined as the intercept from the regression of monthly excess fund return on the four risk factors of Market, SMB, HML and UMD. C represents the incentive in the advisory contract. In panel A, Coles' incentive rate (CIR) is used as the measure of incentive, while in panel B, Weighted incentive rate (WIR) is the measure of incentive; with the Effective fee rate (EFR) being the level of fees in both panels. F is the size of the fund-family in terms of logarithm of total TNA of the family and X represents other control variables as defined in the earlier tables.

The equation is estimated using a two-step procedure. Since CIR is right-censored at 0 and WIR is right-censored at 1 in the sample, Tobit regressions of concavity regressed on the set of instruments and controls variables is used to calculate the estimated values of CIR and WIR. The average account size and the expense ratio are used as instruments in the first stage regressions. The estimated values of CIR and WIR are then used in the second stage estimations that are reported below. Survival probability is the estimated probability of survival for a fund obtained from the parametric hazard rate model.

In both panels, columns (1)-(3) present the results of estimating the regression equation in a panel regression framework with White's heteroscedasticity consistent robust standard errors. In columns (4) and (5), we also adjust the standard errors of the estimates to allow for clustering at the fund level and at the fund-family level, respectively. We use only the funds belonging to one of the following three categories, according to ICDI classification in CRSP database, in our analysis: LG, AG, and GI and with at least 80% of assets invested in equities. Index funds are excluded from the analysis. All specifications include year dummies to control for time fixed effects and columns (2)-(5) includes category dummies to control for category fixed effects.

The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Table 9. Panel A. Risk-Adjusted Return and Incentives (Coles' Incentive Rate)

Dependent Variable :	Fund Annual 4-Factor Alpha				
	(1)	(2)	(3)	(4)	(5)
Coles' Incentive Rate (CIR)	0.0212***	0.0337***	0.0355***	0.0355***	0.0355***
	(4.27)	(4.61)	(5.20)	(4.70)	(4.20)
Effective Fee Rate (EFR)	0.0062**	0.0181***	0.0192***	0.0192***	0.0192***
	(2.00)	(3.37)	(3.72)	(3.33)	(2.98)
Survival Probability	-	-	0.0291***	0.0291***	0.0291***
	-	-	(5.61)	(5.49)	(5.33)
ln (Family TNA)	0.0004*	0.0011***	0.0014***	0.0014***	0.0014***
	(1.80)	(3.25)	(4.24)	(3.96)	(3.62)
ln (Fund TNA)	0.0003**	0.0005***	-0.0000	-0.0000	-0.0000
	(2.06)	(2.63)	(-0.13)	(-0.12)	(-0.11)
New Money Inflow	-0.0004	-0.0007**	-0.0009***	-0.0009***	-0.0009***
	(-1.50)	(-2.57)	(-3.30)	(-3.09)	(-3.02)
Fund Age	0.0002***	0.0004***	0.0004***	0.0004***	0.0004***
	(3.96)	(4.43)	(5.00)	(4.63)	(4.12)
Lagged Fund Return Volatility	-0.0649***	-0.0666***	-0.0638***	-0.0638***	-0.0638***
	(-6.82)	(-6.91)	(-6.72)	(-6.91)	(-6.40)
Turnover Ratio	-0.0007***	-0.0009***	-0.0009***	-0.0009***	-0.0009***
	(-2.95)	(-3.76)	(-4.03)	(-3.60)	(-3.50)
12b-1 Expense	0.0003*	0.0006***	0.0007***	0.0007***	0.0007***
	(1.92)	(2.98)	(3.70)	(3.64)	(3.28)
Minimum Required Investment	0.0000	0.0000	0.0000**	0.0000*	0.0000*
	(0.10)	(1.48)	(2.04)	(1.83)	(1.75)
Performance Based Fee	-0.0134***	-0.0202***	-0.0202***	-0.0202***	-0.0202***
	(-3.41)	(-4.08)	(-4.38)	(-3.83)	(-3.24)
Fee on Rival Performance	-0.0101***	-0.0166***	-0.0152***	-0.0152***	-0.0152***
	(-3.75)	(-4.32)	(-4.28)	(-3.81)	(-3.43)
Intercept	-0.0229**	-0.0517***	-0.0783***	-0.0783***	-0.0783***
	(-2.50)	(-3.54)	(-5.23)	(-4.82)	(-4.40)
Year Dummies	Yes	Yes	Yes	Yes	Yes
Category Dummies	No	Yes	Yes	Yes	Yes
Clustering	No	No	No	Fund Level	Family Level
Number of Observations	2867	2867	2867	2867	2867
R-square	0.1438	0.1483	0.1549	0.1549	0.1549

Table 9. Panel B. Risk-Adjusted Return and Incentives (Weighted Incentive Rate)

Dependent Variable :	Fund Annual 4-Factor Alpha				
	(1)	(2)	(3)	(4)	(5)
Weighted Incentive Rate (WIR)	0.0518***	0.0573***	0.0628***	0.0628***	0.0628***
	(4.09)	(4.12)	(4.84)	(4.37)	(3.92)
Effective Fee Rate (EFR)	0.0139***	0.0173***	0.0192***	0.0192***	0.0192***
	(2.86)	(3.00)	(3.48)	(3.11)	(2.78)
Survival Probability	-	-	0.0301***	0.0301***	0.0301***
	-	-	(5.78)	(5.77)	(5.61)
ln (Family TNA)	0.0009***	0.0011***	0.0015***	0.0015***	0.0015***
	(2.71)	(2.93)	(4.01)	(3.72)	(3.39)
ln (Fund TNA)	0.0005***	0.0006***	0.0001	0.0001	0.0001
	(2.70)	(2.82)	(0.45)	(0.40)	(0.35)
New Money Inflow	-0.0006**	-0.0007**	-0.0009***	-0.0009***	-0.0009***
	(-2.18)	(-2.40)	(-3.23)	(-3.01)	(-2.94)
Fund Age	0.0003***	0.0004***	0.0004***	0.0004***	0.0004***
	(3.96)	(3.99)	(4.69)	(4.32)	(3.85)
Lagged Fund Return Volatility	-0.0360***	-0.0319***	-0.0261**	-0.0261**	-0.0261**
	(-3.65)	(-3.01)	(-2.49)	(-2.52)	(-2.28)
Turnover Ratio	-0.0009***	-0.0010***	-0.0011***	-0.0011***	-0.0011***
	(-3.94)	(-4.10)	(-4.53)	(-4.10)	(-3.96)
12b-1 Expense	0.0004**	0.0005**	0.0006***	0.0006***	0.0006***
	(2.35)	(2.52)	(3.38)	(3.31)	(2.98)
Minimum Required Investment	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.46)	(0.81)	(1.42)	(1.26)	(1.21)
Performance Based Fee	-0.0157***	-0.0170***	-0.0175***	-0.0175***	-0.0175***
	(-3.50)	(-3.61)	(-3.98)	(-3.49)	(-2.95)
Fee on Rival Performance	-0.0120***	-0.0133***	-0.0123***	-0.0123***	-0.0123***
	(-3.73)	(-3.80)	(-3.81)	(-3.38)	(-3.08)
Intercept	-0.1019***	-0.1164***	-0.1527***	-0.1527***	-0.1527***
	(-3.58)	(-3.66)	(-4.94)	(-4.49)	(-4.06)
Year Dummies	Yes	Yes	Yes	Yes	Yes
Category Dummies	No	Yes	Yes	Yes	Yes
Clustering	No	No	No	Fund Level	Family Level
Number of Observations	2919	2919	2919	2919	2919
R-square	0.1475	0.1484	0.1554	0.1554	0.1554

Table 10. Fund Performance and Incentives: Portfolio Analysis

This table presents the average performance for quintile portfolios of mutual funds sorted on incentives. Portfolios are equally weighted monthly, so the weights are readjusted whenever a fund disappears. Performance is measured as the intercept from a regression of excess portfolio return on the four risk factors commonly used in the literature: Market, SMB, HML and UMD.

$$R_i - r_f = \alpha + \beta_1 (MKT - r_f) + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + \varepsilon_i$$

The table also reports the difference in performance between the highest incentive and the lowest incentive portfolios. In panel A, funds are sorted based on the Coles' incentive rate (CIR) as the measure of incentive, while in panel B, the sorting is based on the Weighted incentive rate (WIR) as the measure of incentive. The t-statistics are reported in parentheses.

Table 10. Fund Performance and Incentives

Portfolio	Average Monthly Excess Return	Std. Dev. of Monthly Excess Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Panel A : Coles' Incentive Rate					
1 (High Incentive)	0.0060	0.0536	-0.0005	1.0285	0.2163	0.0623	0.0124	98.31%
			(-0.65)	(55.88)	(11.97)	(2.63)	(1.01)	
2	0.0042	0.0533	-0.0022	1.0147	0.2703	0.1039	-0.0244	97.89%
			(-2.66)	(49.50)	(13.43)	(3.93)	(-1.80)	
3	0.0042	0.0527	-0.0027	1.0243	0.2734	0.1387	0.0019	97.55%
			(-3.02)	(46.99)	(12.77)	(4.94)	(0.13)	
4	0.0040	0.0512	-0.0026	1.0217	0.1715	0.1354	0.0070	96.66%
			(-2.57)	(41.31)	(7.06)	(4.25)	(0.43)	
5 (Low Incentive)	0.0038	0.0543	-0.0027	1.0430	0.1474	0.0126	0.0410	97.99%
			(-3.19)	(51.23)	(7.37)	(0.48)	(3.04)	
1 - 5 spread	0.0023	0.0070	0.0022	-0.0145	0.0689	0.0497	-0.0287	18.07%
			(3.15)	(-0.86)	(4.17)	(2.29)	(-2.57)	
			Panel B : Weighted Incentive Rate					
1 (High Incentive)	0.0060	0.0484	-0.0001	0.9821	0.1295	0.1476	-0.0173	98.28%
			(-0.07)	(58.62)	(7.87)	(6.83)	(-1.56)	
2	0.0058	0.0518	-0.0009	1.0198	0.2172	0.1184	0.0122	98.02%
			(-1.11)	(53.01)	(11.50)	(4.77)	(0.96)	
3	0.0027	0.0532	-0.0041	1.0104	0.3054	0.1199	-0.0039	97.24%
			(-4.28)	(43.20)	(13.30)	(3.98)	(-0.25)	
4	0.0038	0.0570	-0.0031	1.0766	0.2613	0.0681	0.0125	96.88%
			(-2.82)	(40.43)	(9.99)	(1.98)	(0.71)	
5 (Low Incentive)	0.0038	0.0564	-0.0026	1.0556	0.1640	-0.0256	0.0394	97.62%
			(-2.73)	(45.95)	(7.27)	(-0.86)	(2.59)	
1 - 5 spread	0.0022	0.0139	0.0025	-0.0736	-0.0345	0.1732	-0.0567	67.19%
			(2.93)	(-3.50)	(-1.67)	(6.38)	(-4.07)	

Table 11. Fund Performance and Incentives after Controlling for Fund Survival Probability.

This table presents the average performance for quintile portfolios of mutual funds sorted on incentives. Portfolios are equally weighted monthly, so the weights are readjusted whenever a fund disappears. Performance is measured as the intercept from a regression of excess portfolio return on the four risk factors commonly used in the literature: Market, SMB, HML and UMD.

$$R_i - r_f = \alpha + \beta_1 (MKT - r_f) + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + \varepsilon_i$$

Funds are first sorted into 5 groups based on the quintile values of survival probability. Within each of the 5 groups, these funds are further sorted into quintile portfolios based on incentives. In the next step, the top incentive quintiles from each of the 5 groups are combined to form the portfolio of the highest incentive funds. Similar aggregation is done for the other incentive quintiles. The 5 resulting portfolios of mutual funds sorted on incentives have similar variance in survival probabilities across them.

The table also reports the difference in performance between the highest incentive and the lowest incentive portfolios. In panel A, funds are sorted based on the Coles' incentive rate (CIR) as the measure of incentive, while in panel B, the sorting is based on the Weighted incentive rate (WIR) as the measure of incentive. The t-statistics are reported in parentheses.

Table 11. Fund Performance and Incentives Controlling for Fund Survival Probability

Portfolio	Average Monthly Excess Return	Std. Dev. of Monthly Excess Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Panel A : Coles' Incentive Rate					
1 (High Incentive)	0.0063	0.0531	-0.0002	1.0239	0.2235	0.0780	0.0044	98.50%
			(-0.32)	(59.61)	(13.25)	(3.52)	(0.38)	
2	0.0043	0.0533	-0.0022	1.0137	0.2695	0.0989	-0.0146	97.73%
			(-2.51)	(47.81)	(12.94)	(3.62)	(-1.04)	
3	0.0038	0.0542	-0.0033	1.0389	0.2933	0.1236	0.0139	96.95%
			(-3.18)	(41.57)	(11.95)	(3.84)	(0.84)	
4	0.0041	0.0509	-0.0023	1.0140	0.1657	0.1229	0.0009	97.49%
			(-2.67)	(47.58)	(7.92)	(4.47)	(0.06)	
5 (Low Incentive)	0.0037	0.0537	-0.0027	1.0426	0.1258	0.0309	0.0336	97.83%
			(-3.10)	(49.88)	(6.13)	(1.15)	(2.43)	
1 - 5 spread	0.0026	0.0071	0.0024	-0.0187	0.0977	0.0471	-0.0293	31.70%
			(3.82)	(-1.20)	(6.41)	(2.35)	(-2.85)	
			Panel B : Weighted Incentive Rate					
1 (High Incentive)	0.0059	0.0481	-0.0004	0.9861	0.1490	0.1680	-0.0093	98.63%
			(-0.65)	(66.21)	(10.19)	(8.75)	(-0.94)	
2	0.0058	0.0527	-0.0009	1.0129	0.2439	0.0925	0.0143	97.31%
			(-0.95)	(44.35)	(10.88)	(3.14)	(0.95)	
3	0.0032	0.0539	-0.0035	1.0219	0.2833	0.1072	-0.0045	96.63%
			(-3.28)	(39.10)	(11.04)	(3.18)	(-0.26)	
4	0.0034	0.0549	-0.0032	1.0528	0.2361	0.0826	0.0029	97.68%
			(-3.58)	(47.67)	(10.88)	(2.90)	(0.20)	
5 (Low Incentive)	0.0038	0.0572	-0.0026	1.0710	0.1634	-0.0222	0.0399	97.31%
			(-2.58)	(43.22)	(6.71)	(-0.70)	(2.43)	
1 - 5 spread	0.0021	0.0143	0.0022	-0.0849	-0.0144	0.1903	-0.0491	68.37%
			(2.55)	(-3.99)	(-0.69)	(6.94)	(-3.49)	

Table 12. Performance Persistence and Incentives.

For the period 1996-2003, on December 31st of each year, mutual funds are first sorted into quintile portfolios based on their calendar year alphas from a four-factor model. Then within each quintile portfolio, funds are further sorted into five groups based on the quintile values of incentives. In panel A, Coles' incentive rate (CIR) is used as the measure of incentive, while in panel B, Weighted incentive rate (WIR) is the measure of incentive. For each alpha-based quintile portfolio, we classify the top incentive quintile as the high incentive group and the bottom incentive quintile as the low incentive group. For the following year *(t+1)*, funds with the highest alphas in year t comprise the quintile 1 and funds with the lowest alphas comprise the quintile 5.

The portfolios are equally weighted monthly, so that the weights are readjusted whenever a fund disappears. The portfolios of funds are rebalanced every year. To capture the difference in performance, we also form a spread portfolio between quintile 1 and quintile 5 for each of the two incentive groups. We also form two long-short portfolios. In the first one, we are long in the funds that belong to the top alpha quintile in the high-incentive group and are short in the funds that belong to the top alpha quintile in the low-incentive group. In the second one, we are long in the funds that belong to the bottom alpha quintile in the high-incentive group and are short in the funds that belong to the bottom alpha quintile in the low-incentive group.

The above procedure results in a total of 14 time-series of returns. The excess returns of the quintile portfolios and the returns on the spread and long-short portfolios are then regressed on the four risk factors of Market, SMB, HML and UMD. The reported alphas in the table are the intercept of this model. We also report the average and standard deviation of raw excess returns for the portfolios. The t-statistics are reported in parentheses.

Table 12. Panel A. Performance Persistence and Incentives (Coles Incentive Rate)

Portfolio	Average Monthly Excess Return	Std. Dev. of Monthly Excess Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Incentive :								
1 (Prior Year Top Performers)	0.0106	0.0637	0.0041	1.0167	0.3783	-0.1670	0.0915	93.74%
			(2.36)	(24.51)	(9.13)	(-3.15)	(3.32)	
2	0.0058	0.0549	-0.0000	1.0264	0.1468	-0.0272	0.0347	95.75%
			(-0.02)	(34.88)	(4.99)	(-0.72)	(1.77)	
3	0.0053	0.0468	-0.0004	0.9776	0.0535	0.2158	-0.0439	95.91%
			(-0.39)	(39.74)	(2.18)	(6.86)	(-2.69)	
4	0.0032	0.0540	-0.0028	1.0123	0.1854	0.0182	0.0271	94.67%
			(-2.08)	(31.25)	(5.73)	(0.44)	(1.26)	
5 (Prior Year Bottom Performers)	0.0004	0.0565	-0.0077	1.0894	0.3158	0.2268	0.0371	89.03%
			(-3.79)	(22.39)	(6.50)	(3.64)	(1.15)	
1 - 5 spread	0.0102	0.0315	0.0118	-0.0727	0.0625	-0.3938	0.0544	28.69%
			(4.08)	(-1.05)	(0.91)	(-4.45)	(1.18)	
Low Incentive :								
1 (Prior Year Top Performers)	0.0037	0.0611	-0.0030	1.0330	0.3320	-0.0782	0.0808	92.35%
			(-1.66)	(23.53)	(7.57)	(-1.39)	(2.77)	
2	0.0042	0.0509	-0.0011	1.0129	0.0380	0.0547	-0.0141	97.32%
			(-1.24)	(46.74)	(1.76)	(1.97)	(-0.98)	
3	0.0043	0.0510	-0.0007	1.0084	-0.0087	0.0127	0.0070	97.11%
			(-0.80)	(44.74)	(-0.39)	(0.44)	(0.47)	
4	0.0031	0.0507	-0.0028	1.0427	0.0075	0.1095	0.0222	96.03%
			(-2.53)	(39.71)	(0.29)	(3.26)	(1.27)	
5 (Prior Year Bottom Performers)	0.0033	0.0592	-0.0035	1.1126	0.1903	0.0527	0.0315	91.34%
			(-1.83)	(24.56)	(4.20)	(0.91)	(1.05)	
1 - 5 spread	0.0004	0.0300	0.0004	-0.0796	0.1417	-0.1309	0.0492	9.48%
			(0.14)	(-1.07)	(1.91)	(-1.38)	(1.00)	
Long-Short Portfolio :								
Top Performance Quintile : High Incentive (1) - Low Incentive (1)	0.0069	0.0163	0.0071	-0.0164	0.0463	-0.0888	0.0107	5.74%
			(4.16)	(-0.40)	(1.13)	(-1.69)	(0.39)	
Bottom Performance Quintile : High Incentive (5) - Low Incentive (5)	-0.0030	0.0220	-0.0042	-0.0232	0.1255	0.1741	0.0056	7.44%
			(-1.84)	(-0.42)	(2.28)	(2.47)	(0.15)	

Table 12. Panel B. Performance Persistence and Incentives (Weighted Incentive Rate)

Portfolio	Average Monthly Excess Return	Std. Dev. of Monthly Excess Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Incentive :								
1 (Prior Year Top Performers)	0.0089	0.0526	0.0025	0.9905	0.2436	0.0643	0.0272	95.16%
			(2.03)	(32.95)	(8.11)	(1.67)	(1.36)	
2	0.0050	0.0487	-0.0008	0.9804	0.1058	0.1385	-0.0137	94.80%
			(-0.65)	(33.95)	(3.67)	(3.75)	(-0.71)	
3	0.0046	0.0444	-0.0009	0.9474	0.0062	0.2560	-0.0475	96.09%
			(-0.92)	(41.51)	(0.27)	(8.77)	(-3.14)	
4	0.0025	0.0519	-0.0029	0.9818	0.1368	0.0157	-0.0074	95.72%
			(-2.46)	(35.22)	(4.91)	(0.44)	(-0.40)	
5 (Prior Year Bottom Performers)	0.0012	0.0530	-0.0064	1.0629	0.2141	0.2760	0.0243	86.89%
			(-3.10)	(21.30)	(4.30)	(4.32)	(0.73)	
1 - 5 spread	0.0077	0.0241	0.0090	-0.0723	0.0295	-0.2116	0.0029	8.65%
			(3.60)	(-1.21)	(0.49)	(-2.77)	(0.07)	
Low Incentive :								
1 (Prior Year Top Performers)	0.0047	0.0633	-0.0023	1.0513	0.3630	-0.0886	0.0910	91.55%
			(-1.17)	(21.99)	(7.60)	(-1.45)	(2.86)	
2	0.0036	0.0499	-0.0023	1.0067	0.1111	0.1030	0.0003	98.02%
			(-3.08)	(55.13)	(6.09)	(4.41)	(0.03)	
3	0.0049	0.0518	-0.0004	1.0051	0.0322	-0.0300	0.0448	97.25%
			(-0.46)	(44.99)	(1.44)	(-1.05)	(3.02)	
4	0.0022	0.0542	-0.0039	1.0847	0.0536	0.1046	0.0108	93.58%
			(-2.64)	(30.36)	(1.50)	(2.29)	(0.46)	
5 (Prior Year Bottom Performers)	0.0024	0.0614	-0.0046	1.1320	0.2544	0.0395	0.0288	92.27%
			(-2.50)	(25.48)	(5.74)	(0.70)	(0.97)	
1 - 5 spread	0.0023	0.0286	0.0023	-0.0807	0.1086	-0.1281	0.0622	8.56%
			(0.78)	(-1.14)	(1.53)	(-1.41)	(1.32)	
Long-Short Portfolio :								
Top Performance Quintile : High Incentive (1) - Low Incentive (1)	0.0043	0.0205	0.0049	-0.0608	-0.1194	0.1529	-0.0638	38.40%
			(2.79)	(-1.45)	(-2.85)	(2.86)	(-2.29)	
Bottom Performance Quintile : High Incentive (5) - Low Incentive (5)	-0.0012	0.0220	-0.0018	-0.0692	-0.0404	0.2364	-0.0045	34.63%
			(-0.94)	(-1.50)	(-0.88)	(4.00)	(-0.15)	

Table 13. Performance Persistence and Incentives after Controlling for Fund Survival Probability.

For the period 1996-2003, mutual funds are first sorted into 5 groups each year based on the quintile values of survival probability. Then on December 31st of each year, within each quintile group based on survival probability, mutual funds are further sorted into quintile portfolios based on their calendar year alphas from a four-factor model. In the next step, the top alpha quintiles from each of the 5 survival groups are combined to form the portfolio of the highest alpha funds. Similar aggregation is done for the other alpha-based quintile portfolios. The 5 resulting portfolios of mutual funds sorted on alphas have similar variance in survival probabilities across them.

Then within each quintile portfolio, funds are further sorted into five groups based on the quintile values of incentives. In panel A, Coles' incentive rate (CIR) is used as the measure of incentive, while in panel B, Weighted incentive rate (WIR) is the measure of incentive. For each alpha-based quintile portfolio, we classify the top incentive quintile as the high incentive group and the bottom incentive quintile as the low incentive group. For the following year *(t+1)*, funds with the highest alphas in year t comprise the quintile 1 and funds with the lowest alphas comprise the quintile 5.

The portfolios are equally weighted monthly, so that the weights are readjusted whenever a fund disappears. The portfolios of funds are rebalanced every year. To capture the difference in performance, we also form a spread portfolio between quintile 1 and quintile 5 for each of the two incentive groups. We also form two long-short portfolios. In the first one, we are long in the funds that belong to the top alpha quintile in the high-incentive group and are short in the funds that belong to the top alpha quintile in the low-incentive group. In the second one, we are long in the funds that belong to the bottom alpha quintile in the high-incentive group and are short in the funds that belong to the bottom alpha quintile in the low-incentive group.

The above procedure results in a total of 14 time-series of returns. The excess returns of the quintile portfolios and the returns on the spread and long-short portfolios are then regressed on the four risk factors of Market, SMB, HML and UMD. The reported alphas in the table are the intercept of this model. We also report the average and standard deviation of raw excess returns for the portfolios. The t-statistics are reported in parentheses.

Table 13. Panel A. Performance Persistence and Incentives (Coles' Incentive Rate) Controlling for Fund Survival Probability

Portfolio	Average Monthly Excess Return	Std. Dev. of Monthly Excess Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Incentive :								
1 (Prior Year Top Performers)	0.0107	0.0680	0.0037	1.0417	0.4501	-0.2029	0.1255	93.65%
			(2.00)	(23.38)	(10.12)	(-3.56)	(4.24)	
2	0.0069	0.0521	0.0016	0.9974	0.1172	0.0206	-0.0165	96.69%
			(1.52)	(40.49)	(4.76)	(0.65)	(-1.01)	
3	0.0036	0.0474	-0.0016	0.9820	0.0158	0.2178	-0.0819	96.79%
			(-1.75)	(44.47)	(0.72)	(7.71)	(-5.58)	
4	0.0040	0.0545	-0.0024	1.0056	0.2543	0.0168	0.0400	95.97%
			(-2.05)	(35.39)	(8.96)	(0.46)	(2.12)	
5 (Prior Year Bottom Performers)	0.0013	0.0568	-0.0067	1.0895	0.2975	0.1867	0.0622	89.38%
			(-3.36)	(22.65)	(6.19)	(3.03)	(1.94)	
1 - 5 spread	0.0095	0.0342	0.0104	-0.0478	0.1526	-0.3895	0.0634	35.39%
			(3.51)	(-0.67)	(2.14)	(-4.26)	(1.33)	
Low Incentive :								
1 (Prior Year Top Performers)	0.0032	0.0599	-0.0037	1.0659	0.3005	-0.0193	0.0660	93.71%
			(-2.29)	(27.28)	(7.70)	(-0.39)	(2.54)	
2	0.0029	0.0521	-0.0024	0.9942	0.1148	0.0097	-0.0164	97.27%
			(-2.54)	(44.45)	(5.14)	(0.34)	(-1.11)	
3	0.0054	0.0497	-0.0002	1.0134	-0.0152	0.0675	0.0342	96.35%
			(-0.18)	(41.03)	(-0.62)	(2.14)	(2.08)	
4	0.0033	0.0522	-0.0030	1.0631	0.0817	0.1478	0.0083	94.45%
			(-2.26)	(33.23)	(2.56)	(3.61)	(0.39)	
5 (Prior Year Bottom Performers)	0.0027	0.0595	-0.0037	1.1075	0.1386	-0.0068	0.0508	91.29%
			(-1.94)	(24.26)	(3.04)	(-0.12)	(1.68)	
1 - 5 spread	0.0005	0.0273	-0.0000	-0.0416	0.1619	-0.0125	0.0152	4.47%
			(-0.01)	(-0.60)	(2.34)	(-0.14)	(0.33)	
Long-Short Portfolio :								
Top Performance Quintile : High Incentive (1) - Low Incentive (1)	0.0075	0.0202	0.0074	-0.0242	0.1497	-0.1835	0.0595	42.70%
			(4.48)	(-0.61)	(3.76)	(-3.60)	(2.25)	
Bottom Performance Quintile : High Incentive (5) - Low Incentive (5)	-0.0015	0.0199	-0.0030	-0.0180	0.1589	0.1935	0.0113	14.08%
			(-1.53)	(-0.38)	(3.32)	(3.15)	(0.36)	

Table 13. Panel B. Performance Persistence and Incentives (Weighted Incentive Rate) Controlling for Fund Survival Probability

Portfolio	Average Monthly Excess Return	Std. Dev. of Monthly Excess Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Incentive :								
1 (Prior Year Top Performers)	0.0091	0.0553	0.0026	1.0062	0.2458	-0.0080	0.0608	94.37%
			(1.86)	(29.51)	(7.22)	(-0.18)	(2.68)	
2	0.0054	0.0498	-0.0007	0.9830	0.1674	0.1303	-0.0071	94.55%
			(-0.56)	(32.51)	(5.54)	(3.37)	(-0.36)	
3	0.0040	0.0436	-0.0015	0.9360	0.0041	0.2804	-0.0592	96.75%
			(-1.75)	(45.82)	(0.20)	(10.74)	(-4.36)	
4	0.0041	0.0513	-0.0016	0.9859	0.1375	0.0486	-0.0011	95.00%
			(-1.25)	(33.06)	(4.62)	(1.27)	(-0.05)	
5 (Prior Year Bottom Performers)	-0.0001	0.0525	-0.0071	1.0521	0.1781	0.2296	0.0057	89.39%
			(-3.86)	(23.67)	(4.01)	(4.04)	(0.19)	
1 - 5 spread	0.0092	0.0251	0.0098	-0.0459	0.0677	-0.2376	0.0551	20.14%
			(4.02)	(-0.79)	(1.16)	(-3.19)	(1.42)	
Low Incentive :								
1 (Prior Year Top Performers)	0.0041	0.0630	-0.0031	1.0656	0.3518	-0.0676	0.0952	91.84%
			(-1.59)	(22.80)	(7.54)	(-1.13)	(3.07)	
2	0.0043	0.0530	-0.0012	1.0095	0.1329	-0.0029	0.0063	97.62%
			(-1.36)	(47.50)	(6.26)	(-0.11)	(0.45)	
3	0.0044	0.0491	-0.0008	0.9855	0.0141	0.0631	0.0004	96.64%
			(-0.83)	(42.12)	(0.60)	(2.11)	(0.03)	
4	0.0037	0.0577	-0.0027	1.1240	0.0652	0.0477	0.0481	92.08%
			(-1.54)	(26.61)	(1.55)	(0.88)	(1.71)	
5 (Prior Year Bottom Performers)	0.0019	0.0586	-0.0048	1.1076	0.1932	0.0630	0.0125	92.39%
			(-2.72)	(26.34)	(4.60)	(1.17)	(0.45)	
1 - 5 spread	0.0022	0.0289	0.0017	-0.0420	0.1586	-0.1305	0.0827	16.21%
			(0.58)	(-0.61)	(2.31)	(-1.48)	(1.81)	
Long-Short Portfolio :								
Top Performance Quintile : High Incentive (1) - Low Incentive (1)	0.0050	0.0177	0.0057	-0.0594	-0.1060	0.0595	-0.0344	20.25%
			(3.35)	(-1.45)	(-2.58)	(1.13)	(-1.26)	
Bottom Performance Quintile : High Incentive (5) - Low Incentive (5)	-0.0020	0.0180	-0.0024	-0.0555	-0.0150	0.1666	-0.0069	23.78%
			(-1.39)	(-1.36)	(-0.37)	(3.18)	(-0.25)	

Table 14. Performance Persistence and Incentives Controlling for Fund Survival Probability: Alternative Portfolio Construction.

For the period 1996-2003, mutual funds are first sorted into 5 groups each year based on the quintile values of survival probability. Then within each quintile group, funds are further sorted into five groups based on the quintile values of incentives. In panel A, Coles' incentive rate (CIR) is used as the measure of incentive, while in panel B, Weighted incentive rate (WIR) is the measure of incentive. In the next step, the top incentive quintiles from each of the 5 survival groups are combined to form the portfolio of the highest incentive funds. Similar aggregation is done for the other incentive-based quintiles. The 5 resulting portfolios of mutual funds sorted on incentives have similar variance in survival probabilities across them. We classify the top incentive quintile as the high incentive group and the bottom incentive quintile as the low incentive group.

Then on December 31st of each year, within each of the high incentive and low incentive groups, mutual funds are further sorted into quintile portfolios based on their calendar year alphas from a four-factor model. For the following year *(t+1)*, funds with the highest alphas in year t comprise the quintile 1 and funds with the lowest alphas comprise the quintile 5.

The portfolios are equally weighted monthly, so that the weights are readjusted whenever a fund disappears. The portfolios of funds are rebalanced every year. To capture the difference in performance, we also form a spread portfolio between quintile 1 and quintile 5 for each of the two incentive groups. We also form two long-short portfolios. In the first one, we are long in the funds that belong to the top alpha quintile in the high-incentive group and are short in the funds that belong to the top alpha quintile in the low-incentive group. In the second one, we are long in the funds that belong to the bottom alpha quintile in the high-incentive group and are short in the funds that belong to the bottom alpha quintile in the low-incentive group.

The above procedure results in a total of 14 time-series of returns. The excess returns of the quintile portfolios and the returns on the spread and long-short portfolios are then regressed on the four risk factors of Market, SMB, HML and UMD. The reported alphas in the table are the intercept of this model. We also report the average and standard deviation of raw excess returns for the portfolios. The t-statistics are reported in parentheses.

Table 14. Panel A. Alternative Sort: Performance Persistence and Incentives (Coles' Incentive Rate)

Portfolio	Average Monthly Excess Return	Std. Dev. of Monthly Excess Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Incentive :								
1 (Prior Year Top Performers)	0.0104	0.0703	0.0039	1.0371	0.4584	-0.2622	0.0930	92.87%
			(1.94)	(21.26)	(9.41)	(-4.20)	(2.87)	
2	0.0074	0.0489	0.0017	0.9966	0.0891	0.1522	-0.0332	97.01%
			(1.87)	(45.37)	(4.06)	(5.42)	(-2.27)	
3	0.0041	0.0494	-0.0017	0.9836	0.1580	0.1329	-0.0368	97.40%
			(-1.95)	(47.50)	(7.64)	(5.02)	(-2.67)	
4	0.0020	0.0503	-0.0044	0.9946	0.2214	0.1836	-0.0230	94.52%
			(-3.49)	(32.51)	(7.24)	(4.69)	(-1.13)	
5 (Prior Year Bottom Performers)	0.0020	0.0581	-0.0052	1.0835	0.2596	0.0784	0.0490	91.32%
			(-2.79)	(24.36)	(5.84)	(1.38)	(1.66)	
1 - 5 spread	0.0084	0.0328	0.0091	-0.0463	0.1988	-0.3406	0.0440	36.66%
			(3.22)	(-0.68)	(2.93)	(-3.93)	(0.98)	
Low Incentive :								
1 (Prior Year Top Performers)	0.0036	0.0593	-0.0031	1.0366	0.2966	-0.0610	0.0808	94.29%
			(-2.01)	(28.12)	(8.06)	(-1.29)	(3.30)	
2	0.0028	0.0520	-0.0026	1.0125	0.0639	0.0040	0.0125	97.67%
			(-3.02)	(49.15)	(3.10)	(0.15)	(0.91)	
3	0.0026	0.0502	-0.0023	0.9933	-0.0094	0.0218	-0.0059	97.16%
			(-2.51)	(45.15)	(-0.43)	(0.78)	(-0.40)	
4	0.0067	0.0526	0.0012	1.0468	-0.0266	0.0895	0.0024	91.66%
			(0.74)	(26.53)	(-0.68)	(1.77)	(0.09)	
5 (Prior Year Bottom Performers)	0.0023	0.0558	-0.0040	1.0658	0.1730	0.0803	-0.0038	92.78%
			(-2.46)	(27.33)	(4.44)	(1.61)	(-0.15)	
1 - 5 spread	0.0013	0.0254	0.0009	-0.0292	0.1236	-0.1413	0.0846	18.90%
			(0.37)	(-0.49)	(2.09)	(-1.86)	(2.15)	
Long-Short Portfolio :								
Top Performance Quintile : High Incentive (1) - Low Incentive (1)	0.0068	0.0208	0.0070	0.0005	0.1618	-0.2012	0.0122	44.49%
			(4.19)	(0.01)	(4.03)	(-3.91)	(0.46)	
Bottom Performance Quintile : High Incentive (5) - Low Incentive (5)	-0.0003	0.0151	-0.0012	0.0177	0.0866	-0.0019	0.0528	11.12%
			(-0.76)	(0.48)	(2.34)	(-0.04)	(2.14)	

Table 14. Panel B. Alternative Sort: Performance Persistence and Incentives (Weighted Incentive Rate)

Portfolio	Average Monthly Excess Return	Std. Dev. of Monthly Excess Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
High Incentive :								
1 (Prior Year Top Performers)	0.0104	0.0522	0.0040	0.9807	0.2796	0.1012	-0.0118	95.26%
			(3.28)	(33.18)	(9.47)	(2.68)	(-0.60)	
2	0.0052	0.0490	-0.0004	0.9739	0.1152	0.1141	-0.0207	95.39%
			(-0.35)	(35.58)	(4.21)	(3.26)	(-1.14)	
3	0.0044	0.0438	-0.0010	0.9249	0.0454	0.2544	-0.0589	95.69%
			(-1.05)	(39.12)	(1.92)	(8.42)	(-3.75)	
4	0.0015	0.0493	-0.0045	1.0096	0.1278	0.2379	-0.0706	95.42%
			(-3.97)	(36.80)	(4.66)	(6.78)	(-3.87)	
5 (Prior Year Bottom Performers)	0.0020	0.0521	-0.0048	1.0229	0.2010	0.1894	0.0142	89.40%
			(-2.63)	(23.21)	(4.57)	(3.36)	(0.48)	
1 - 5 spread	0.0083	0.0192	0.0089	-0.0422	0.0785	-0.0882	-0.0260	4.78%
			(4.38)	(-0.87)	(1.62)	(-1.42)	(-0.80)	
Low Incentive :								
1 (Prior Year Top Performers)	0.0054	0.0683	-0.0020	1.0648	0.3988	-0.2043	0.1831	92.49%
			(-1.00)	(21.90)	(8.21)	(-3.29)	(5.67)	
2	0.0046	0.0522	-0.0010	1.0149	0.0805	0.0014	0.0309	97.34%
			(-1.10)	(45.84)	(3.64)	(0.05)	(2.10)	
3	0.0045	0.0554	-0.0011	1.0477	0.0744	-0.0601	0.0534	96.59%
			(-1.00)	(39.38)	(2.80)	(-1.77)	(3.02)	
4	0.0046	0.0549	-0.0021	1.1002	0.0681	0.1570	0.0228	89.82%
			(-1.09)	(24.16)	(1.50)	(2.70)	(0.75)	
5 (Prior Year Bottom Performers)	0.0028	0.0608	-0.0038	1.1320	0.1517	0.0298	0.0281	89.62%
			(-1.78)	(22.22)	(2.98)	(0.46)	(0.83)	
1 - 5 spread	0.0026	0.0379	0.0018	-0.0672	0.2472	-0.2341	0.1550	30.52%
			(0.51)	(-0.82)	(3.02)	(-2.23)	(2.84)	
Long-Short Portfolio :								
Top Performance Quintile : High Incentive (1) - Low Incentive (1)	0.0049	0.0291	0.0061	-0.0841	-0.1193	0.3055	-0.1949	62.54%
			(3.14)	(-1.82)	(-2.58)	(5.16)	(-6.33)	
Bottom Performance Quintile : High Incentive (5) - Low Incentive (5)	-0.0008	0.0205	-0.0011	-0.1091	0.0494	0.1596	-0.0139	20.77%
			(-0.53)	(-2.30)	(1.04)	(2.62)	(-0.44)	

Table 15. Performance Persistence and Incentives: Probit Analysis.

This table presents the probit estimates of the following equation.

$$D_{winner,i} = \lambda_{winner} + \beta_{winner} C_i + \gamma_{winner} F_i + \delta_{winner} X_i + \nu_i$$

D_{winner} is a dummy variable that takes the value of 1 if the fund's risk-adjusted return is above the median fund in both current and previous year and takes the value of 0 otherwise. C represents the incentive in the advisory contract. In panel A, Coles' incentive rate (CIR) is used as the measure of incentive, while in panel B, Weighted incentive rate (WIR) is the measure of incentive; with the Effective fee rate (EFR) being the level of fees in both panels. F is the size of the fund-family in terms of logarithm of total TNA of the family and X represents other control variables as defined in the earlier tables.

The equation is estimated using a two-step procedure. Since CIR is right-censored at 0 and WIR is right-censored at 1 in the sample, Tobit regressions of concavity regressed on the set of instruments and controls variables is used to calculate the estimated values of CIR and WIR. The average account size and the expense ratio are used as instruments in the first stage regressions. The estimated values of CIR and WIR are then used in the second stage estimations that are reported below. Survival probability is the estimated probability of survival for a fund obtained from the parametric hazard rate model.

In both panels, columns (1)-(3) present the results of estimating the regression equation in a panel regression framework with White's heteroscedasticity consistent robust standard errors. In columns (4) and (5), we also adjust the standard errors of the estimates to allow for clustering at the fund level and at the fund-family level, respectively. The marginal effects are reported in column (6) for the specification used in column (4). We use only the funds belonging to one of the following three categories, according to ICDI classification in CRSP database, in our analysis: LG, AG, and GI and with at least 80% of assets invested in equities. Index funds are excluded from the analysis. All specifications include year dummies to control for time fixed effects and columns (2)-(5) includes category dummies to control for category fixed effects.

The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Table 15. Panel A. Winners Persistence and Incentives (Coles' Incentive Rate)

	(1)	(2)	(3)	(4)	(5)	(6)
Coles' Incentive Rate (CIR)	0.0778***	0.1155***	0.1382***	0.1382***	0.1382***	0.0433
	(8.24)	(6.99)	(9.04)	(8.70)	(8.07)	
Effective Fee Rate (EFR)	0.0144***	0.0535***	0.0662***	0.0662***	0.0662***	0.0207
	(3.05)	(5.22)	(6.86)	(6.42)	(5.52)	
Survival Probability	-	-	12.1395***	12.1395***	12.1395***	3.8020
	-	-	(7.02)	(6.55)	(6.44)	
ln (Family TNA)	0.1737***	0.3995***	0.5730***	0.5730***	0.5730***	0.1795
	(5.01)	(5.76)	(8.60)	(8.37)	(7.73)	
ln (Fund TNA)	0.1496***	0.1887***	0.0363	0.0363	0.0363	0.0114
	(5.99)	(6.16)	(0.98)	(0.86)	(0.86)	
New Money Inflow	-0.0255	-0.1306***	-0.2279***	-0.2279***	-0.2279***	-0.0714
	(-0.71)	(-2.68)	(-4.85)	(-4.69)	(-4.63)	
Fund Age	0.0748***	0.1211***	0.1470***	0.1470***	0.1470***	0.0460
	(6.97)	(6.40)	(8.34)	(8.09)	(6.97)	
Lagged Fund Return Volatility	-0.0303**	-0.0365***	-0.0347**	-0.0347**	-0.0347**	-0.0109
	(-2.39)	(-2.66)	(-2.51)	(-2.30)	(-2.08)	
Turnover Ratio	-0.1518***	-0.2171***	-0.2522***	-0.2522***	-0.2522***	-0.0790
	(-4.84)	(-5.92)	(-6.77)	(-6.13)	(-6.01)	
12b-1 Expense	0.1307***	0.2190***	0.2801***	0.2801***	0.2801***	0.0877
	(4.13)	(4.96)	(6.71)	(7.40)	(6.71)	
Minimum Required Investment	0.0000	0.0002***	0.0003***	0.0003***	0.0003***	0.0001
	(0.41)	(2.78)	(3.95)	(3.52)	(3.66)	
Performance Based Fee	-4.5401***	-6.6977***	-7.6594***	-7.6594***	-7.6594***	-0.2535
	(-6.27)	(-6.09)	(-7.31)	(-7.91)	(-7.34)	
Fee on Rival Performance	-3.5278***	-5.4830***	-5.7130***	-5.7130***	-5.7130***	-0.2566
	(-6.52)	(-6.27)	(-6.96)	(-6.62)	(-6.14)	
Intercept	-9.7526***	-18.9263***	-32.8085***	-32.8085***	-32.8085***	
	(-6.50)	(-6.36)	(-10.06)	(-9.99)	(-9.04)	
Year Dummies	Yes	Yes	Yes	Yes	Yes	
Category Dummies	No	Yes	Yes	Yes	Yes	
Clustering	No	No	No	Fund Level	Family Level	
Number of Observations	2867	2867	2867	2867	2867	
Pseudo R-square	0.0777	0.0978	0.1287	0.1287	0.1287	

Table 15. Panel B. Winners Persistence and Incentives (Weighted Incentive Rate)

	(1)	(2)	(3)	(4)	(5)	(6)
Weighted Incentive Rate (WIR)	0.1841***	0.1976***	0.2453***	0.2453***	0.2453***	0.0774
	(6.66)	(6.36)	(8.35)	(8.03)	(7.41)	
Effective Fee Rate (EFR)	0.0411***	0.0522***	0.0679***	0.0679***	0.0679***	0.0214
	(4.49)	(4.66)	(6.35)	(5.96)	(5.13)	
Survival Probability	-	-	12.2854***	12.2854***	12.2854***	3.8787
	-	-	(7.02)	(6.62)	(6.48)	
ln (Family TNA)	0.3518***	0.4128***	0.6134***	0.6134***	0.6134***	0.1937
	(5.27)	(5.23)	(7.95)	(7.72)	(7.09)	
ln (Fund TNA)	0.2197***	0.2300***	0.0919**	0.0919**	0.0919*	0.0290
	(6.34)	(6.20)	(2.22)	(1.99)	(1.94)	
New Money Inflow	-0.1040**	-0.1291**	-0.2388***	-0.2388***	-0.2388***	-0.0754
	(-2.20)	(-2.49)	(-4.70)	(-4.55)	(-4.43)	
Fund Age	0.1076***	0.1180***	0.1493***	0.1493***	0.1493***	0.0471
	(5.95)	(5.77)	(7.68)	(7.43)	(6.45)	
Lagged Fund Return Volatility	0.0696***	0.0803***	0.1090***	0.1090***	0.1090***	0.0344
	(4.86)	(5.08)	(6.80)	(6.50)	(5.95)	
Turnover Ratio	-0.2504***	-0.2723***	-0.3276***	-0.3276***	-0.3276***	-0.1034
	(-6.32)	(-6.36)	(-7.60)	(-7.13)	(-6.75)	
12b-1 Expense	0.1642***	0.1790***	0.2435***	0.2435***	0.2435***	0.0769
	(4.17)	(4.19)	(5.94)	(6.61)	(5.91)	
Minimum Required Investment	0.0001	0.0001*	0.0002***	0.0002**	0.0002***	0.0001
	(1.04)	(1.74)	(2.90)	(2.57)	(2.67)	
Performance Based Fee	-5.2218***	-5.6039***	-6.5850***	-6.5850***	-6.5850***	-0.2556
	(-5.62)	(-5.48)	(-6.63)	(-7.22)	(-6.69)	
Fee on Rival Performance	-4.0679***	-4.4092***	-4.6320***	-4.6320***	-4.6320***	-0.2576
	(-5.69)	(-5.57)	(-6.13)	(-5.82)	(-5.40)	
Intercept	-37.5447***	-41.4972***	-61.9265***	-61.9265***	-61.9265***	
	(-6.31)	(-6.08)	(-9.05)	(-8.85)	(-8.06)	
Year Dummies	Yes	Yes	Yes	Yes	Yes	
Category Dummies	No	Yes	Yes	Yes	Yes	
Clustering	No	No	No	Fund Level	Family Level	
Number of Observations	2919	2919	2919	2919	2919	
Pseudo R-square	0.0821	0.0851	0.1162	0.1162	0.1162	

Table 16. Fund Buy-and-Hold Return and Incentives.

This table presents the average risk-adjusted return from following a buy-and-hold strategy on the mutual funds' observed holdings for quintile portfolios of funds sorted on incentives. Portfolios are equally weighted monthly, so the weights are readjusted whenever a fund disappears. Performance is measured as the intercept from a regression of excess buy-and-hold return on the four risk factors commonly used in the literature: Market, SMB, HML and UMD.

$$Buy\_Hold_i - r_f = \alpha + \beta_1 (MKT - r_f) + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + \varepsilon_i$$

The table also reports the difference in risk-adjusted buy-and-hold return between the highest incentive and the lowest incentive portfolios. In panel A, funds are sorted based on the Coles' incentive rate (CIR) as the measure of incentive, while in panel B, the sorting is based on the Weighted incentive rate (WIR) as the measure of incentive. The t-statistics are reported in parentheses.

Table 16. Fund Buy and Hold Return and Incentives

Portfolio	Average Monthly Excess Buy-Hold Return	Std. Dev. of Monthly Excess Buy-Hold Return	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A : Coles' Incentive Rate								
1 (High Incentive)	0.0069	0.0535	0.0003	1.0401	0.1979	0.0787	0.0162	97.96%
			(0.31)	(51.54)	(9.99)	(3.02)	(1.21)	
2	0.0057	0.0534	-0.0011	1.0256	0.2755	0.1137	-0.0060	98.17%
			(-1.34)	(53.81)	(14.72)	(4.63)	(-0.47)	
3	0.0055	0.0528	-0.0015	1.0334	0.2639	0.1418	0.0063	97.54%
			(-1.62)	(47.17)	(12.27)	(5.02)	(0.44)	
4	0.0052	0.0523	-0.0013	1.0402	0.1595	0.1364	-0.0094	96.28%
			(-1.16)	(39.03)	(6.09)	(3.97)	(-0.53)	
5 (Low Incentive)	0.0055	0.0544	-0.0007	1.0473	0.1196	0.0124	0.0265	97.82%
			(-0.83)	(49.31)	(5.73)	(0.45)	(1.89)	
1 - 5 spread	0.0014	0.0067	0.0010	-0.0073	0.0783	0.0663	-0.0103	22.05%
			(1.51)	(-0.46)	(5.07)	(3.27)	(-0.99)	
Panel B : Weighted Incentive Rate								
1 (High Incentive)	0.0071	0.0489	0.0007	1.0026	0.1271	0.1593	0.0020	97.91%
			(0.91)	(53.69)	(6.93)	(6.62)	(0.16)	
2	0.0066	0.0514	-0.0001	1.0207	0.2047	0.1295	0.0102	98.08%
			(-0.11)	(54.33)	(11.10)	(5.34)	(0.82)	
3	0.0045	0.0533	-0.0025	1.0282	0.2975	0.1394	0.0063	97.20%
			(-2.63)	(43.60)	(12.85)	(4.58)	(0.40)	
4	0.0051	0.0572	-0.0017	1.0843	0.2391	0.0719	-0.0027	96.78%
			(-1.51)	(39.99)	(8.98)	(2.05)	(-0.15)	
5 (Low Incentive)	0.0055	0.0571	-0.0006	1.0584	0.1483	-0.0424	0.0210	97.23%
			(-0.61)	(42.11)	(6.01)	(-1.31)	(1.26)	
1 - 5 spread	0.0016	0.0138	0.0013	-0.0558	-0.0212	0.2017	-0.0190	64.85%
			(1.50)	(-2.58)	(-1.00)	(7.23)	(-1.33)	

Table 17. Fund Return Gap and Incentives.

This table presents the average risk-adjusted return gap for quintile portfolios of mutual funds sorted on incentives. Portfolios are equally weighted monthly, so the weights are readjusted whenever a fund disappears. Performance is measured as the intercept from a regression of return gap on the four risk factors commonly used in the literature: Market, SMB, HML and UMD.

$$Gap_i = \alpha + \beta_1(MKT - r_f) + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + \varepsilon_i$$

The table also reports the difference in risk-adjusted return gap between the highest incentive and the lowest incentive portfolios. In panel A, funds are sorted based on the Coles' incentive rate (CIR) as the measure of incentive, while in panel B, the sorting is based on the Weighted incentive rate (WIR) as the measure of incentive. The t-statistics are reported in parentheses.

Table 17. Fund Return Gap and Incentives

Portfolio	Average Monthly Return Gap	Std. Dev. of Monthly Return Gap	4-Factor Model					
			Alpha	Rm - Rf	SMB	HML	MOM	Adj. R-square
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Panel A : Coles Incentive Rate					
1 (High Incentive)	0.0006	0.0028	0.0008	-0.0172	0.0001	-0.0060	-0.0040	2.25%
			(2.50)	(-2.31)	(0.01)	(-0.63)	(-0.81)	
2	-0.0002	0.0026	-0.0001	-0.0075	-0.0030	0.0004	-0.0058	0.07%
			(-0.19)	(-1.11)	(-0.45)	(0.05)	(-1.30)	
3	0.0004	0.0024	0.0005	-0.0151	0.0029	-0.0106	-0.0019	3.09%
			(2.01)	(-2.45)	(0.48)	(-1.33)	(-0.47)	
4	0.0003	0.0026	0.0004	-0.0222	0.0043	-0.0050	0.0094	22.75%
			(1.51)	(-3.64)	(0.71)	(-0.63)	(2.33)	
5 (Low Incentive)	-0.0004	0.0029	-0.0005	-0.0072	0.0151	-0.0002	0.0118	13.53%
			(-1.88)	(-1.02)	(2.18)	(-0.02)	(2.52)	
1 - 5 spread	0.0010	0.0035	0.0013	-0.0100	-0.0150	-0.0058	-0.0158	9.16%
			(3.66)	(-1.15)	(-1.76)	(-0.52)	(-2.74)	
			Panel B : Weighted Incentive Rate					
1 (High Incentive)	0.0003	0.0025	0.0005	-0.0167	0.0082	-0.0132	-0.0079	7.19%
			(1.84)	(-2.61)	(1.31)	(-1.60)	(-1.86)	
2	0.0003	0.0027	0.0004	-0.0079	-0.0084	-0.0014	-0.0037	0.61%
			(1.42)	(-1.09)	(-1.18)	(-0.15)	(-0.77)	
3	-0.0001	0.0028	0.0001	-0.0227	0.0005	-0.0017	-0.0098	12.04%
			(0.38)	(-3.25)	(0.07)	(-0.19)	(-2.13)	
4	0.0006	0.0029	0.0006	-0.0136	0.0103	-0.0137	0.0124	18.58%
			(1.94)	(-1.96)	(1.51)	(-1.53)	(2.71)	
5 (Low Incentive)	-0.0003	0.0033	-0.0005	-0.0077	0.0074	0.0116	0.0158	12.87%
			(-1.54)	(-0.96)	(0.94)	(1.12)	(2.97)	
1 - 5 spread	0.0006	0.0035	0.0010	-0.0090	0.0008	-0.0248	-0.0236	17.06%
			(2.87)	(-1.08)	(0.10)	(-2.29)	(-4.25)	

Table 18. Portfolio Liquidity vs. Concavity and Effective Fee Rate

This table presents the estimates of the following equation:

$$Liq = \alpha + \beta C + \gamma F + \varepsilon$$

Here, *Liq* represents the portfolio liquidity of the fund in a given year, *C* is the incentive structure contained in the advisory contract and *F* represents fund characteristics. Coles' Incentive Rate (CIR) is the measure of concavity of advisory contract in panel A, while Weighted Incentive Rate (WIR) is the measure of concavity in panel B. All observations are at fund-year level.

We use Amihud illiquidity ratio as the measures of stock liquidity. The portfolio liquidity of the fund is then calculated as negative of the logarithm of value-weighted average of the individual stock's liquidity in the portfolio of the fund. Specifically,

$$Liq_{ft} = -\ln\left(\sum_i \theta_{it} I1_{it}\right)$$

where $\theta_{it} = \frac{n_{it} P_{it}}{TNA_{ft}}$ is the portfolio weight in stock *i* at time *t* in the portfolio of the fund *f*.

Both equations are estimated using a two-step procedure. Since CIR is right-censored at 0 and WIR is right-censored at 1 in the sample, Tobit regressions of concavity regressed on the instruments and controls variables are used to calculate the estimated values of concavity. Similarly, the estimated value of effective fee rate is obtained from an OLS regression of effective fee rate on the instruments and control variables. The "average account size" and the "expense ratio" are used as instruments for concavity and for effective fee rates. The estimated values of effective fee rate and concavity are made orthogonal by regressing estimated effective fee rate on estimated concavity and taking the residual. The estimated concavity and the residual, i.e. the part of estimated effective fee rate that is orthogonal to concavity are then used in the second stage estimation that is reported below.

In both panels, column (1) presents the results of estimating the regression equation in a pooled regression framework. In columns (2), (3) and (4), we adjust the standard errors of the estimates to allow for clustering at the fund level, at the family level and at the year level, respectively. Column (5) presents the estimates of panel between-effect regression, where time-series average of the dependent variable is regressed on the time-series averages of the independent variables. We use only the funds belonging to one of the following five categories, according to ICDI classification in CRSP database, in our analysis: LG, AG, GI, BL and IE and with at least 80% of assets invested in equities. Index funds are excluded from the analysis. All specifications include category dummies. The t-statistics are reported in parentheses. The symbols ***, **, * denote significance levels of 1%, 5% and 10%, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Table 18. Panel A. Portfolio Liquidity vs. Coles' Incentive Rate and Effective Fee Rate

Dependent Variable :	Average Portfolio Liquidity				
	Pooled Regression	Clustered Regression at Fund Level	Clustered Regression at Family Level	Clustered Regression at Year Level	Between Effect Regression
	(1)	(2)	(3)	(4)	(5)
Coles' Incentive Rate (CIR)	-4.4704**	-4.4704*	-4.4704	-4.4704***	-5.1959*
	(-2.34)	(-1.66)	(-1.52)	(-5.94)	(-1.67)
Effective Fee Rate (EFR)	-7.5148***	-7.5148***	-7.5148***	-7.5148***	-8.7687***
	(-4.71)	(-3.14)	(-2.90)	(-6.51)	(-4.65)
ln (Family TNA)	-0.1849***	-0.1849*	-0.1849*	-0.1849***	-0.2323**
	(-2.71)	(-1.89)	(-1.72)	(-4.25)	(-2.32)
ln (Fund TNA)	-0.2775**	-0.2775	-0.2775	-0.2775***	-0.3310*
	(-2.33)	(-1.59)	(-1.44)	(-4.76)	(-1.86)
New Money Inflow	-0.0979	-0.0979	-0.0979	-0.0979	-0.1601
	(-1.09)	(-0.88)	(-0.63)	(-1.01)	(-1.40)
Age	-0.0541***	-0.0541*	-0.0541*	-0.0541***	-0.0647**
	(-2.69)	(-1.88)	(-1.72)	(-5.28)	(-2.05)
Turnover	0.2890***	0.2890***	0.2890***	0.2890***	0.3562***
	(4.96)	(3.40)	(3.16)	(5.01)	(5.00)
Prior Year Return	0.8506**	0.8506*	0.8506*	0.8506	0.0883
	(2.57)	(1.87)	(1.71)	(0.96)	(0.15)
Prior Year Volatility	0.1272	0.1272	0.1272	0.1272	1.4243
	(0.07)	(0.05)	(0.04)	(0.04)	(0.51)
12b-1 Expense	-1.7004	-1.7004	-1.7004	-1.7004	-2.1911
	(-1.03)	(-0.94)	(-0.88)	(-1.11)	(-1.47)
Min. Required Investment	-0.0005***	-0.0005**	-0.0005**	-0.0005***	-0.0006***
	(-2.85)	(-2.05)	(-1.99)	(-4.00)	(-2.61)
Performance Based Fee	1.0158	1.0158	1.0158	1.0158**	1.2572
	(1.59)	(1.26)	(1.12)	(2.23)	(1.16)
Fee on Rival Performance	2.2798***	2.2798**	2.2798*	2.2798***	2.3515
	(2.67)	(1.96)	(1.88)	(6.60)	(1.58)
Intercept	15.7200***	15.7200**	15.7200*	15.7200***	18.5590**
	(3.03)	(2.09)	(1.90)	(5.29)	(2.49)
Category Dummies	Yes	Yes	Yes	Yes	Yes
Number of Observations	3764	3764	3764	3764	1526
R-square	32.90%	32.90%	32.90%	32.90%	35.30%

Table 18. Panel B. Portfolio Liquidity vs. Weighted Incentive Rate and Effective Fee Rate

Dependent Variable :	Average Portfolio Liquidity				
	Pooled Regression	Clustered Regression at Fund Level	Clustered Regression at Family Level	Clustered Regression at Year Level	Between Effect Regression
	(1)	(2)	(3)	(4)	(5)
Weighted Incentive Rate (WIR)	-10.5312**	-10.5312*	-10.5312	-10.5312***	-12.4175*
	(-2.36)	(-1.68)	(-1.54)	(-6.06)	(-1.68)
Effective Fee Rate (EFR)	-7.5182***	-7.5182***	-7.5182***	-7.5182***	-8.8461***
	(-4.62)	(-3.11)	(-2.85)	(-6.93)	(-4.28)
ln (Family TNA)	-0.2018***	-0.2018*	-0.2018*	-0.2018***	-0.2549**
	(-2.62)	(-1.84)	(-1.67)	(-4.58)	(-2.14)
ln (Fund TNA)	-0.3515**	-0.3515*	-0.3515	-0.3515***	-0.4233*
	(-2.42)	(-1.67)	(-1.51)	(-5.23)	(-1.88)
New Money Inflow	-0.1765**	-0.1765*	-0.1765	-0.1765*	-0.2492***
	(-2.21)	(-1.84)	(-1.24)	(-1.88)	(-2.65)
Age	-0.0592***	-0.0592*	-0.0592*	-0.0592***	-0.0718**
	(-2.64)	(-1.86)	(-1.69)	(-5.61)	(-2.00)
Turnover	0.3648***	0.3648***	0.3648***	0.3648***	0.4467***
	(4.65)	(3.22)	(2.93)	(5.99)	(4.14)
Prior Year Return	0.9805**	0.9805*	0.9805*	0.9805	0.2258
	(2.55)	(1.84)	(1.68)	(1.10)	(0.34)
Prior Year Volatility	-2.2655	-2.2655	-2.2655	-2.2655	-1.4804
	(-1.38)	(-1.00)	(-0.82)	(-0.69)	(-0.60)
12b-1 Expense	-1.9004	-1.9004	-1.9004	-1.9004	-2.4429
	(-1.11)	(-1.00)	(-0.95)	(-1.22)	(-1.54)
Min. Required Investment	-0.0004***	-0.0004**	-0.0004**	-0.0004***	-0.0005***
	(-2.72)	(-1.99)	(-1.99)	(-3.55)	(-2.58)
Performance Based Fee	1.0238	1.0238	1.0238	1.0238**	1.2710
	(1.60)	(1.27)	(1.12)	(2.29)	(1.16)
Fee on Rival Performance	0.2980	0.2980	0.2980	0.2980	0.0982
	(0.97)	(0.90)	(0.91)	(1.45)	(0.14)
Intercept	28.8911***	28.8911*	28.8911*	28.8911***	34.3116**
	(2.71)	(1.90)	(1.73)	(5.99)	(2.03)
Category Dummies	Yes	Yes	Yes	Yes	Yes
Number of Observations	3829	3829	3829	3829	1537
R-square	32.82%	32.82%	32.82%	32.82%	35.36%