Speed of Information Diffusion within Fund Families

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ABSTRACT

We examine how speed of information diffusion within mutual fund families affects the performance and trading behavior of the corresponding member mutual funds. Timely information flows within the organization lead to better fund performance, and even more so when information flows across funds with different rather than similar investment styles. Furthermore, fast information diffusion within a family results in more trading activity by the member funds. It also leads to greater interdependence of member mutual funds in information production and utilization, as member funds hold portfolios that resemble those of affiliated funds but differ from the portfolios of their peers.

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1 Introduction

Timely dissemination of information within a corporation is important in that it can increase the breadth and depth of information available to key players, ultimately leading to better decision making. For example, timely information dissemination can increase the breadth of a manager's information by making her aware of new production techniques used elsewhere in the organization. Similarly, timely information dissemination can increase the depth of a manager's information by making her aware of expertise elsewhere in the organization, which she could combine with her own expertise to improve her own production process. However, quick information transmission, which is likely to make information readily available to all members of the organization, could provide perverse incentives for some of the managers to free-ride on the efforts of others (see, e.g., Cabrera and Cabrera (2002)). Therefore, it is unclear whether a corporation stands to gain or lose from timely information dissemination across its constituents.

In this paper, we use the mutual fund industry as a testing laboratory to examine how the speed of information flows within an organization affects performance. Using the fund industry is particularly attractive for several reasons: First, almost all mutual funds operate within larger organizations, i.e., mutual fund families, which allows us to analyze the question based on a broad array of organizations and organizational units. Second, since fund managers trade in response to new information, and we are able to observe their trades, it is easier to measure the speed of information flows within mutual fund families than within corporations where detailed data at the unit level is typically not available. Third, since the performance of mutual funds is easy to observe and measure, we can test how speed of information dissemination affects performance.

Our approach for measuring the speed of information transmission within a fund family is intuitively straightforward. We argue that fast information diffusion allows information to spread out quickly within an organization. However, observing directly how information spreads is impossible. For this reason, we trace the spread of information from the trades of mutual funds. Since information makes investors trade (see, e.g., Milgrom and Stokey (1982)), following introduction of new information on a particular stock to the family, the sequence of fund trades on that same stock should tell us how fast information travels within the fund family.

Using a broad sample of actively managed US domestic equity funds for the 2004 – 2012 period, we examine whether faster information transmission within fund families leads to superior performance for the member funds. Our argument is that fast information diffusion increases both the breadth and depth of the information available to a portfolio manager, enabling her to make better investment decisions. Simply put, knowing what information has been collected or what analysis has been conducted by other members of the fund family could inform the portfolio manager about new stocks that she has not followed before (increased breadth) or add to the depth of her existing knowledge about stocks she is currently following.

Our results support the hypothesis that faster information transmission within mutual fund families results in superior performance for the member funds. Specifically, a performance comparison suggests that funds from families with high speed of information diffusion (relative to the median family) outperform funds from families with low speed of information diffusion by up to 60 basis points per year. This suggests that the active efforts of some fund families to reduce information barriers and increase the speed of information flows are justified by concrete performance benefits.[1]

A concern is that our measure is not capturing information diffusion but other family characteristics that positively affect fund performance. For example, families with higher speed

[1] Anecdotal evidence suggests that many fund families actively try to limit information barriers within their organizations. For instance, some fund families organize regular daily meetings where analysts and portfolio managers exchange their views on the market and specific companies. Some others introduce incentives in their managers' compensation structure to promote cooperation or encourage active exchange of ideas. Moreover, some fund families structure their processes so that employees from different funds are in close proximity to each other being either in the same building or even on the same floor.

of information diffusion might employ more skilled managers who would perform better irrespective of the degree of information diffusion within the company. To address this concern, we first relate our measure to several organizational structures that should either ease or hinder the flow of information and therefore the speed with which information is spread out in the organization. Consistent with our measure capturing the speed of information flows, our results show that the speed of information diffusion is higher if the family has fewer information barriers, i.e., fewer outsourced funds managed by external advisors, fewer managers, and more connections among its managers through management of the same funds.

As a further validation exercise, we employ a placebo test, where we relate our measure to the performance of index funds from our sample fund families. Since index funds are passively managed, their performance should not be affected by the speed of information diffusion of the corresponding fund family. Our results support this hypothesis. There is no significant effect of the speed of information diffusion on the performance of index funds, while we still find a strong positive performance impact for the group of actively-managed funds.

To establish causality from our measure of information diffusion to fund performance, we exploit an exogenous variation in the speed of information diffusion arising when a fund is taken over by another family. If the speed of information diffusion causes fund performance, then the induced increase (decrease) in the speed of information diffusion for this fund should lead to an increase (decrease) in fund performance after the family switch. Our results from a standard Difference-in-Differences approach prove consistent with this view. Funds that experience an increase (decrease) in the speed of information diffusion when changing families show a significant increase (decrease) in their control-adjusted performance after the change.

We next explore whether the positive performance effect associated with faster information dissemination is attributable to timely information flows within units or across units. One can think of a fund family as a collection of units, where each unit is comprised of funds that share similar investment styles.[2] Fund managers within each unit (e.g., growth funds unit or large cap funds unit) often analyze the same stocks, conduct similar analyses, and are likely to have similar expertise, which would suggest a great deal of overlap in their information sets. On the other hand, managers from different units analyze distinct stock universes and have distinct types of expertise, which would suggest a smaller overlap in their information sets. Therefore, timely information within units can do little to increase the information available to each portfolio manager, whereas timely information across units is likely to increase the information set of portfolio managers both in terms of breadth and depth. The resulting empirical prediction is that fast information dissemination is more valuable, i.e., has a stronger impact on fund performance, when information flows across rather than within units.

To test this prediction, we introduce two modified measures of the speed of information diffusion and then examine how they relate to performance. The first one measures speed of information dissemination within units and the second one measures it across units. We find that only the cross-unit measure is positively and significantly related to fund performance. Thus, only timely information dissemination across units can bring about performance improvements, suggesting that only cross-unit timely information can increase the amount of information available to fund managers in a significant way.

Besides performance consequences, we address how the speed of information diffusion within families influences trading behavior. We hypothesize that funds belonging to families with high speed of information diffusion trade more. The rationale is that timely information flows within a family are likely to help update the information sets of fund managers more frequently and, consequently, make them trade more often. Our results provide strong support for this hypothesis. Employing portfolio turnover as a general measure of trading activity and the rates at which funds add new stocks (initiating buys) or completely sell existing portfolio

[2] In fact, fund families often have different groups of managers, each being responsible for a lineup of funds that specialize in large cap stocks, small cap stocks, growth stocks, value stocks, and so on.

stocks (terminating sales) as measures of trading activity particularly motivated by new information, we show that funds from families with high speed of information diffusion are more active traders. Specifically, compared to families with low speed of information diffusion their portfolio turnover is more than ten percentage points higher. Similarly, their fraction of initiating buys or terminating sales is more than three percentage points higher.

Our last set of analyses addresses how speed of information dissemination across funds affects the extent of portfolio similarity with affiliated and peer funds. We first hypothesize that fund portfolios from a family with high speed of information diffusion are more similar to each other than fund portfolios from a family with low speed of information diffusion. Intuitively, high speed of information diffusion within the family is likely to increase the overlap in the information sets of managers in the family, which would result in similar trading and, ultimately, similar fund portfolios. Our tests support this hypothesis. Portfolios of funds belonging to the same family show a portfolio overlap that is about 1.6 to 4.2 percentage points higher in families with higher speed of information diffusion.

Our second hypothesis states that a fund portfolio from a family with quick information dissemination across units is less similar to the typical portfolio held by peer funds with the same investment objective outside the family. The reason is that this fund manager will exploit her expanded information set that reflects her information collection efforts and those of affiliated managers by investing in stocks typically not held by comparable funds. Our results support this hypothesis in that the portfolio overlap with the typical portfolio held by peer funds from other families is up to one percentage points lower for funds from families with high cross-unit speed of information diffusion relative to funds from families with low cross-unit speed of information diffusion.

Our paper contributes to several strands of literature. First, we add to the literature on how the organization of mutual fund companies impacts fund performance. Kacperczyk and Seru (2012) find that funds in families with centralized decision making underperform decentralized counterparts because fund managers have less discretion in their portfolio choice. Pollet and Wilson (2008) provide evidence that the size of a fund family has an impact on the diversification strategy of the affiliated funds. Several other papers emphasize the outstanding roles of top-performing family member funds leading to a preferential treatment by the fund family (see, e.g., Nanda, Wang, and Zheng (2004), Gaspar, Massa, and Matos (2006) and Eisele, Nefedova, and Parise (2014)). Based on this favoritism, a few studies argue that portfolio managers have an incentive to stand out and compete with their colleagues in the same fund family (see, e.g., Kempf and Ruenzi (2008) and Simutin (2013)). Finally, Cici and Rosenfeld (2014) and Pomorski (2009) address the quality of a family's research department. The former find that a family's analysts have investment skills, but their research is not fully used by the associated fund managers due to career concerns. The latter shows that ideas generated by centralized research outperform investments that are more likely generated by a single manager. We contribute to this literature by showing that an organizational structure of a fund family leading to a faster diffusion of investment ideas has a positive impact on the performance of the affiliated funds.

Second, our paper is related to the strand of literature that studies how an investor's social network and word-of-mouth communication shape investment decisions. For example, Pool, Stoffman, and Yonker (2013) provide evidence that fund managers who live close to each other have similar holdings and trades, while Hong, Kubik, and Stein (2005) show a similar behavior among fund managers who work in the same city, but not necessarily for the same fund family. Hvide and Östberg (2015) find for a large sample of retail investors in Norway that their investment decisions are correlated with those of their co-workers but that these decisions do not deliver a positive abnormal performance. We add to these studies by looking at a particular network of professional investors, the intra-family network of fund managers, and demonstrating that this network provides investment value.

Finally, this paper relates to the strategic management literature on knowledge transfer and cooperation of organizational units in an organization. (see, e.g., Tsai (2001) and Hansen (2002)). If corporations recognize and exploit synergies between business units, it leads to more efficient operations, better utilization of resources, and better overall performance of the business units (see, e.g., Gupta and Govindarajan (1986) and Tsai and Ghoshal (1998)). We contribute to this literature by exploiting the unique setting of the mutual fund industry in which the organizational units of a fund family can be easily identified. Looking at the fund industry allows for a clean analysis of whether synergies pay off since there is a wide range of organizational units for which we can precisely measure performance.

The remainder of the paper is organized as follows. In Section 2, we describe the data and the construction of our measure of information diffusion. Section 3 presents the empirical results for the impact of the speed of information diffusion on the performance of the affiliated mutual funds. In Section 4, we examine the investment behavior of funds in families with a high and low level of information diffusion. Section 5 concludes.

2 Data and methodology

2.1 Data sources

We obtain information on fund returns, total net assets under management, fund fees, fund age, investment objectives, and other fund characteristics from the CRSP Survivor-Bias-Free U.S. Mutual Fund Database (CRSP MF). Information provided at the share-class level is aggregated at the fund level by value-weighting all share classes of a fund. We use the management company code from CRSP MF to identify the fund families to which funds belong.

We merge the CRSP MF database with the Thomson Reuters Mutual Fund Holdings Database (MF Holdings) using the MFLINK tables. With regards to funds' portfolio holdings, we focus only on holdings of common stocks (share codes 10 and 11) and obtain additional information about these stocks from the CRSP Monthly Stock Database.

Our final data source is the Morningstar Direct Mutual Fund Database (MS Direct) which provides information about fund managers. We merge MS Direct with the CRSP MF and MF Holdings data using the funds' cusips. We manually check for different spellings of the same manager to come up with a unique identifier for each fund manager. In case of inconsistent manager information across share classes, we check the manager information in the fund's Statement of Additional Information (SAI) contained in forms 485APOS and 485BPOS filed with the SEC.

Our final sample consists of actively managed diversified U.S. domestic equity funds for the June 2004 to March 2012 period.[3] Our sample selection approach consists of the following steps. We first eliminate all international, sector, balanced, bond, index, and money market funds from the data set. Then we exclude all funds that hold less than 50 percent of their assets in common stocks or hold less than ten stocks, on average. The remaining funds are categorized into six style categories (Mid Cap (EDCM), Small Cap (EDCS), Micro Cap (EDCI), Growth (EDYG), Growth & Income (EDYB), and Income (EDYI)) according to their dominating objective code from the CRSP MF database.[4] Finally, we exclude all funds which belong to very small fund families, i.e., families with less than five funds, since the interaction in such small families might be different from the interaction in families of typical size. Our final sample consists of 159 families with 1,708 funds managed by 3,101 distinct managers during our sample period.

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[3] The starting date is determined by the fact that the required reporting frequency of funds changes from semi-annually to quarterly in May 2004.

[4] We use the recently introduced CRSP Style Code, which aggregates the information from the previously used Lipper objective codes, Strategic Insight objective codes, and Wiesenberger objective codes. In the rare cases, that a share class does not provide information on the CRSP Style Code, we use the old classification according to Lipper, Strategic Insight, and Wiesenberger to identify the dominating objective.

2.2 Measuring information diffusion within a fund family

Our measure of the speed of information transmission within a fund family relies on a basic insight. Fast information diffusion allows information to spread out quickly in the organization, causing fund managers to trade instantly and simultaneously. Alternatively, slow information diffusion allows information to spread out gradually in the organization, causing fund managers to trade consecutively.

To implement this idea, we need to identify instances when new information is introduced in the family by one manager or multiple managers. This is likely to happen when a single manager or multiple managers start buying a stock that is not already held by any fund in the family. Alexander, Cici, and Gibson (2007) document that such decisions reflect “strongly positive valuation beliefs”, which we argue to be triggered by newly-generated information. We refer to the interval during which information embedded in the initial buying decisions does not change as an information interval and the point when the initial stock purchase happens as the start of the information interval. As long as the original information generated by the initiating managers does not change, those managers will keep the stock in their portfolio. In other words, when the initiating managers start selling the stock, we assume that the original information has been updated and at this point the information interval has ended.

To capture information diffusion within the family following an initiating stock purchase, we measure the speed with which other funds in the family buy the stock during an information interval. More specifically, we count how many funds in the family buy stock *s* during quarter *q* when the initiating fund(s) bought and how many funds follow later during the information interval. Thus, our measure of information diffusion for a single information interval is defined as:

$$ID_{s,q} = \frac{I-1}{I+J-1}, \qquad (1)$$

where I is the number of funds buying in quarter q and J the number of funds that follow later. Since information diffusion can be observed only when at least two funds trade stock s ($I+J>1$), our measure of information diffusion is bounded between zero and one. Larger values indicate that a higher proportion of funds trade on the new information contemporaneously indicating a higher speed of information diffusion within the family. In the extreme case that all funds buying stock s do so in quarter q, ID equals one. In the other extreme, all funds follow the initiating fund in later periods, then ID equals zero.[5]

Our measure of the speed of information diffusion at the family level for quarter t, denoted by FID_t, is computed by averaging the ID measures corresponding to information intervals, the last purchase of which happens during the last four quarters including quarter t. We average across the last four quarters instead of only using the current quarter t to control for possible seasonal effects in information generation as documented in Ozsoylev, et al. (2014).

2.3 Sample characteristics

Table 1 reports summary statistics for key variables in our dataset, both at the fund and the family level. We present information for the whole sample as well as for subsamples consisting of high (above median) and low (below median) *FID* fund families. We test for differences in means between the subsamples using t-tests.

– Insert TABLE 1 approximately here –

[5] As with initiating buys, one might argue that terminating sales are triggered by newly-generated information. However, they could also be a reflection of the stock reaching the price target of a manager, at which point she decides to sell. We therefore limit the calculation of the speed of information diffusion to initiating buys.

The average fund family in our sample has assets under management of roughly $18.5 billion. Families with high speed of information diffusion are slightly bigger ($18.9 billion) than families with low speed of information diffusion ($18.1 billion), but the difference is not statistically significant. Nonetheless, significant family differences exist among four other dimensions. Families with high speed of information diffusion hold a significantly higher number of stocks across all their funds (681 versus 631 stocks). They also tend to add a higher fraction of new stocks into the family portfolio (18.4% vs. 14.7%). Finally, they house a significantly higher number of funds (12.4 versus 10.4) and investment objectives (4.1 versus 3.9).

In terms of fund characteristics, we find that the typical fund in our sample has an average size of $1.7 billion and is 16 years old. While fund age is not significantly different when comparing high and low *FID* families, high *FID* families have significantly smaller funds ($1.6 billion versus $1.9 billion). In addition, the portfolio characteristics of funds show striking differences among the two groups of families, with funds in high *FID* families holding more stocks (144 versus 118) and less concentrated portfolios as documented by the significantly lower Herfindahl-Index. Funds from high *FID* families also trade significantly more, possibly because timely information flows from other funds in the family enable them to update their information set more frequently. The higher speed of information diffusion and the resulting updates in the information set appear to be valuable since funds from families with high information diffusion deliver a significantly higher Carhart alpha. This relative outperformance of 56 basis points per year does not come from lower fees since fees in both groups do not differ significantly and holds for both net-of-fee as well as gross-of-fee returns.

3 Impact of speed of information diffusion on investment performance

In this section we examine whether and how speed of information diffusion within families affects fund performance. The simple comparisons of Table 1 provided a first hint that faster information diffusion might lead to better fund performance. We now formally test this hypothesis in Section 3.1. We check the validity of our measure in Section 3.2 and establish causality between speed of information diffusion and fund performance in Section 3.3. To understand how speed of information diffusion comes into play, in Section 3.4 we examine whether the performance effect of fast information diffusion is attributable to timely information dissemination within or across units.

3.1 Does speed of information diffusion improve fund performance?

To test our main hypothesis that faster information diffusion within a fund family results in superior performance for the member funds, we employ a pooled regression in which we relate fund performance in quarter *t* with the speed of information measure, *FID,* of the corresponding fund family in quarter *t-1* and several control variables at the fund and family level:

$$
\begin{aligned}
Perf_{i,t} &= \alpha + \beta_1 FID_{i,t-1} + \beta_2 FundSize_{i,t-1} + \beta_3 FundAge_{i,t-1} + \beta_4 FundTurnover_{i,t-1} \\
&\quad + \beta_5 FamSize_{i,t-1} + \beta_6 NewFamStocks_{i,t-1} + \varepsilon_{i,t}
\end{aligned}
\tag{2}
$$

We measure fund performance (*Perf*) using the Jensen (1968) 1-factor model, the Fama and French (1993) 3-factor model, and the Carhart (1997) 4-factor model, respectively. We construct quarterly alphas as the difference of the realized excess fund return and the expected excess fund return in the quarter (each compounded over the three monthly observations in the quarter). We use gross-of-fee returns (obtained by adding back one twelfth of the annual total expense ratio to the net-of-fee return) to calculate alphas since gross returns better reflect the investment ability of fund managers.[6] A fund's expected fund return in a month is calculated using factor loadings estimated over the previous 24 months and factor returns in the month.[7]

We control for other fund and family variables, which might have an impact on fund performance. At the fund level, we control for the logarithm of fund's total net assets (*FundSize*), the logarithm of the fund's age (*FundAge*), and the fund's annual turnover ratio (*FundTurnover*). We also include the logarithm of the fund family's total net assets under management (*FamSize*). Finally, it is possible that our measure merely reflects the amount of information that is produced in the family. To account for this, we control for the quarterly fraction of stocks in the family portfolio that are newly introduced into the family relative to the number of stocks the family held at the previous report date (*NewFamStocks*). To control for any unobservable time or style specific effects, we add quarter and style fixed effects to the regression and cluster standard errors at the fund level.

Table 2 reports the results for the regression (2) as well as for a modified version in which we replace the continuous *FID* measure with a *FID* dummy which equals one if the *FID* value of the family is above the median in quarter *t*.

– Insert TABLE 2 approximately here –

The results in Table 2 support our main hypothesis that the speed of information diffusion is beneficial for fund performance. For both, the continuous *FID* measure and the *FID* dummy, we find that a higher speed of information diffusion is positively related to fund performance. The effect is economically important: Funds from families with above median information

[6] For robustness, we ran the analysis also based on net-of-fee returns. The main conclusion is the same: High speed of information diffusion leads to better fund performance.

[7] Monthly alphas and factor loadings are only calculated, if none of the returns in the past 24 months is missing. This way of calculating fund performance eliminates younger funds from our sample and, thereby, removes any incubation bias (Evans (2010)).

diffusion outperform funds from families with below median *FID* by up to 15 basis points per quarter, corresponding to an annual outperformance of 60 basis points.

The coefficients on the control variables suggest that fund size has a negative impact on fund performance, which is consist with the Berk and Green (2004) argument of diseconomies of scale in the mutual fund industry. Fund age has a positive impact on fund performance. The impact of family size on performance is positive (and thus consistent with e.g., Chen, et al. (2004) and Pollet and Wilson (2008)) but weak in statistical terms. The remaining controls have no notable impact on performance.

3.2 Does our measure capture speed of information diffusion?

In this section we introduce two approaches to establish the validity of our measure. The idea is to address the concern that our measure is not capturing information diffusion but other family characteristics that positively affect fund performance.

3.2.1 Determinants of the speed of information diffusion within a fund family

If our measure truly captures the speed of information diffusion within a fund family, then it should be positively affected to a large extent by whether the fund family has fewer information barriers that impede good communication among its fund managers. Along these lines, we argue that a family has fewer information barriers when: (1) the family funds are primarily run by in-house managers; (2) there are fewer fund managers in the family; and (3) the fund managers are interconnected to a greater extent.

We test whether each of these three family characteristics is related to our speed-of-information-diffusion measure. First, we test whether a higher proportion of outsourced funds is associated with a lower speed of information diffusion within the fund family.[8] The rationale is that managers of outsourced funds belong to other investment management companies and thus usually act independently from the fund family. Therefore, it is less likely that external managers and in-house managers communicate to share ideas.

Our second test relates the speed of information diffusion within a fund family to the number of managers employed by the fund family. The idea is that a smaller number of fund managers within a fund family makes it more likely for the managers to know each other better and communicate more frequently.

Finally, we test whether a higher degree of interconnectedness[9] among a family's managers through common management of funds leads to a higher speed of information diffusion within the family. The rationale is again straightforward. The more closely fund managers work, the more likely they are to communicate with each other, thus causing information to travel more freely within the fund family. To test these three hypotheses, we run the following pooled regression:

$$FID_{f,t} = \alpha + \beta_1 FamComm_{f,t} + \beta_2 \# Funds_{f,t} + \beta_3 AFA_{f,t} + \beta_4 FamFocus_{f,t} + \varepsilon_{i,t} \quad (3)$$

FamComm is our main variable. It captures the factors potentially impacting the communication within the fund family (proportion of outsourced funds, number of managers, and interconnectedness of managers). To control for general differences in fund families, we add the number of funds in the family (*# Funds*), the average fund age (*AFA*), and the family focus (*FamFocus*), defined as the concentration of family assets across the different investment

[8] To identify outsourced funds, we follow Chen, et al. (2013) and compare the names of the fund family given in the CRSP MF database and the investment advisor given in the MF Holdings database. We additionally check for potential affiliations between the two firms.

[9] We measure the interconnectedness by calculating the density of the network of managers within the family. In particular, the network density within a fund family is the actual number of connections between two managers resulting from the co-management of at least one fund divided by the number of potential connections.

objectives (Siggelkow (2003)). All variables are measured in the quarter for which *FID* is calculated. We additionally include quarter fixed effects and cluster standard errors at the family level. The regression results are reported in Table 3.

– Insert TABLE 3 approximately here –

The results in Table 3 support our hypotheses. The speed of information diffusion within a fund family is higher when the family outsources fewer funds, houses fewer managers, and has managers that are interconnected to a greater extent. Moreover, each of the three factors is significantly related to the speed of information regardless of whether it is included in the regressions individually or together with the other two factors.

3.2.2 Speed of information diffusion and performance of index funds

As an additional validation exercise for our measure, we employ a placebo test, where we examine the relation between our measure and the performance of index funds from our sample fund families. In other words, we use US domestic equity index funds as a placebo control group in the performance regression. The rationale is that index funds make no information-related trades and, thus, their performance should not be affected by the speed of information diffusion of their corresponding fund families.

We take this idea to the data by adding 128 index funds (offered by existing sample fund families) to our original sample of actively managed mutual funds[10] and conduct similar analysis as before. However, we now analyze the performance effect of the speed of information diffusion separately for actively-managed funds and index funds. For this purpose, we interact

[10] To identify index funds, we require that the fund name (at any point in time) suggests that the fund is an index fund and that the fund is labeled by CRSP as a pure index fund or ETF/ETN. We further require that the fund holds 80% of its portfolio in common stocks on average. We do not consider enhanced index funds or index-based funds, since these still have an active component.

our *FID* measure with two binary variables capturing the type of the fund, actively-managed fund or index fund. *Active* equals one if the fund is an actively-managed fund and zero otherwise. *Index* equals one if the fund is an index funds and zero otherwise. The results from this test are reported in Table 4.

– Insert TABLE 4 approximately here –

Table 4 results show that the speed of information diffusion is significantly related to the performance of the actively-managed but not to the performance of index funds. We can therefore conclude that our *FID* measure indeed captures the speed with which private information is transferred within the fund family.

3.3 Is there a causal relationship between speed of information diffusion and fund performance?

As with most empirical studies, a natural concern could be that the speed of information diffusion is endogenous. To address this possibility, we exploit an exogenous shock in the information environment of a given fund that arises when that fund is taken over by another family. If the speed of information diffusion causes fund performance, then the induced increase (decrease) in the speed of information diffusion for this fund due to the change in family affiliation should lead to an increase (decrease) in fund performance after the family switch relative to a control group of funds with similar characteristics that do not experience a switch (but potentially could have experienced a switch).

We identify 256 instances in our sample when a fund is taken over by another fund family. Since such events might depend on other fund and family characteristics, we run a standard

Difference-in-Differences approach against a matched sample that include funds that do not switch fund families

For each switching fund (treatment group), we identify a group of control funds that have similar characteristics before the event but do not switch their fund family. More specifically, we use a propensity score matching approach to identify funds that have a similar quarterly performance based on a 4-factor alpha, fund size and age, as well as family size. We additionally include style and time fixed effects when calculating the propensity score. Each fund in the treatment group is matched to an equally-weighted control portfolio of up to five funds with the closest propensity scores in the same period.[11]

We first calculate the performance of each switching fund during the quarter before the event and during the quarter after the event. Next, we calculate for each switching fund the corresponding *FID* measure before the switch, i.e., the *FID* measure of the fund family to which the fund belonged, and the corresponding *FID* measure after the switch, i.e., the *FID* measure of the overtaking fund family. Similar calculations are performed for each of the control portfolios.

We then calculate for each switching fund and its control portfolio the post-minus-pre-switch values for each of the performance measures and for the *FID* measure and then calculate the difference between the two resulting differences. Using all matched pairs, we then test the relation between the difference-in-differences in performance (control-adjusted performance change) and difference-in-differences in the *FID* measure (control-adjusted *FID* change) in a pooled regression. We run the analysis both in a univariate and a multivariate way, where the latter includes the same control variables as in (2) as well as time and style fixed effects. All control variables are measured for the funds in the treatment group before they switch fund

[11] We allow only for control funds whose distance in propensity score with the treated fund is not larger than 0.25 times the standard deviation of propensity scores in the treatment group.

families. Table 5 reports results. Panel A presents the results based on a nearest neighbor matching where only one fund with the closest propensity score in the same period is included in the control group, while in Panel B, we use an equally-weighted portfolio of up to five funds with the closest propensity scores.

– Insert TABLE 5 approximately here –

The results in Table 5 suggest a positive and significant relation between the control-adjusted performance changes and control-adjusted *FID* changes. This supports our main hypothesis. Most importantly, these results suggest that the exogenous shocks to the speed of information diffusion bring about changes in fund performance, supporting the presence of a causal relation between fund performance and speed of information diffusion within the family.

3.4 Is speed of cross-unit information diffusion more valuable?

In this section, we test our second hypothesis, which postulates that timely information flows are more valuable when information is disseminated across rather than within units of the same family. Intuitively fund managers with the same investment objective, i.e., within the same unit, are likely to have a higher overlap in their information sets while fund managers from different units are likely to have a much lower overlap. Hence, fast information dissemination is likely to increase the amount of information available to managers by more when the dissemination happens across units as opposed to within units.

To measure the speed of information diffusion within the same unit, we modify our diffusion measure (1) to include only the sequence of fund trades that happen within the same unit. As before, we then average across all the resulting *ID* measures of all units, to obtain a family level measure, which we refer to as FID^{Within}.[12]

To measure the speed of information diffusion across units, we aggregate the holdings of all funds from each unit to come up with an aggregate portfolio for each unit and modify our measure to include the sequence of trades across the aggregate portfolios of all units. We refer to this modified measure as FID^{Across}.

We modify our pooled regression (2) by replacing the general diffusion measure, *FID*, with each of the new measures separately. In Panel A of Table 6, we present results when the key independent variable is FID^{Within}, while in Panel B when the key independent variable is FID^{Across}.

– Insert TABLE 6 approximately here –

The results in Table 6 support our hypothesis that faster information flows are more valuable when they happen across units rather than within units. While Panel A shows that the speed of information diffusion within units has mostly an insignificant effect on fund performance, Panel B shows a strong positive performance effect associated with the speed of information diffusion across units. The effect is not only statistically significant but also significant in economic terms. As before, funds from families with above median FID^{Across} outperform funds from families with below median FID^{Across} by up to 60 basis points per year.

4 Impact of speed of information diffusion on investment behavior

New information makes fund managers trade and the availability and type of new information should depend, in part, on the speed of information diffusion within the fund

[12] Since a stock might be traded by different units at the same time, the stock can be included multiple times in the same quarter and family.

family. For this reason, we expect the trading behavior of fund managers to be affected by the speed of information diffusion within the family. This is the subject of investigation in this section, whereby we specifically analyze how speed of information diffusion affects trading behavior along two dimensions, trading intensity and portfolio composition. Thus, in Section 4.1 we examine whether speed of information diffusion affects trading intensity. In Sections 4.2 and 4.3 we explore how speed of information diffusion affects portfolio composition relative to other family funds and relative to unaffiliated funds that follow a similar style, respectively.

4.1 Trading intensity

We hypothesize that the amount of trading generated by a fund manager increases with the speed of information diffusion within the family. The reason is that faster information flows within a family are likely to lead to more frequent updates of a fund manager's information set. Since the manager ought to adjust her portfolio in response to her updated information set, we expect her to trade more as the frequency of information updates increases.

We employ three measures of trading intensity. The first one, which is intended to capture general trading activity, is portfolio turnover. We employ two versions of portfolio turnover. The first version is the annual fund turnover provided by CRSP. This variable has the advantage of measuring the turnover of the total portfolio of the fund, but it is only available at an annual frequency. The second version is the turnover ratio of the common stock portfolio, which we calculate at a quarterly frequency using the MF Holdings database. We calculate this measure as the minimum of the dollar value of purchases and sales in a given quarter divided by the average of the total portfolio value at the beginning and end of the quarter.[13] To make this

[13] We calculate portfolio turnover only if the time span between two reports, from which we infer stock trades, is one quarter. To mitigate a possible impact of outliers, we winsorize both turnover measures at the 1st and 99th percentiles.

quarterly turnover ratio comparable to our first measure, we annualize it by multiplying it with four.

The two other measures of trading intensity, ratio of initiating buys and ratio of terminating sales, are intended to capture trading activity primarily motivated by new information. Ratio of initiating buys is the ratio of the number of stocks in a fund's portfolio that have been newly added in the current quarter relative to the number of portfolio stocks at the beginning of the quarter. Ratio of terminating sales is the ratio of the number of stocks in a fund's portfolio that have been completely sold in the current quarter, relative to the number of stocks at the beginning of the quarter.

To test our hypothesis, we estimate pooled regressions, which separately relate each of the three measures of trading intensity (TI) with our key independent variable *FID*. We include several control variables, control for time and style fixed effects, and cluster standard errors at the fund level. The regression equation is specified as follows:

$$\begin{aligned} TI_{i,t} &= \alpha + \beta_1 FID_{i,t} + \beta_2 FundSize_{i,t-1} + \beta_3 FundSize^2_{i,t-1} + \beta_4 FundAge_{i,t-1} \\ &+ \beta_5 FundFlows_{i,t-1} + \beta_6 FundPerf_{i,t-1} + \beta_7 FamSize_{i,t-1} + \varepsilon_{i,t} \end{aligned} \quad (4)$$

We use the contemporaneous *FID* measure since information flows should lead to trading within the same period. The *FID* variable is available on a quarterly basis. When we use the annual turnover as our dependent variable, we average *FID* over the four quarters of the given year. As in Section 3, we use the original (continuous) version of our measure and a dummy variable, which equals one if the *FID* measure of a family is above the median in the respective period.

Our set of control variables includes the controls of Section 3.1 and several additional variables that have been shown in previous studies to influence trading activity (see, e.g., Kacperczyk, Sialm, and Zheng (2008), Cremers and Petajisto (2009), and Pütz and Ruenzi

(2011)). These include the squared fund size to cover a potential non-linear relation between fund size and turnover, net inflows over the previous year (*FundFlows*), and the fund's prior performance, measured as the 4-factor alpha over the previous 24 months (*FundPerf*).[14]

Regression results are presented in Table 7. Panel A reports results for tests based on the general speed of information diffusion measure *FID*, while Panel B reports results for tests based on the speed of cross-unit information diffusion measure (FID^{Across}).

– Insert TABLE 7 approximately here –

Results from Table 7 support the hypothesis that fund trading intensity increases with the speed of information diffusion within the fund family. This holds no matter which of the three measures of trading intensity or which version of portfolio turnover we use as the dependent variable. The effect is highly significant in a statistical sense (significant at the 1%-level in all cases) but also in economic terms. For example, the turnover ratio of funds from families with high speed of information diffusion is more than ten percentage points per year larger than the turnover of funds from families with low speed of information diffusion. Similarly, funds from families with high speed of information diffusion exhibit a significantly higher ratio of initiating buys and terminating sales. Both ratios are more than three percentage points higher for funds from families with high speed of information diffusion. These are economically big differences given that funds from families with low information diffusion, on average, exhibit initiating buys or terminating sales ratios of about 14 percent (ratio of initiating buys = 14.8 percent, ratio of terminating sales = 14.0 percent).

The coefficients on the control variables suggest that fund trading activity decreases with fund size, which is consistent with Pastor, Stambaugh, and Taylor (2014) and Pütz and Ruenzi

[14] Fund flows over the past 12 months are winsorized at the 1st and 99th percentiles.

(2011). Furthermore, trading activity increases with fund age and family size but it decreases with past performance. The positive effect of family size on trading activity is consistent with larger families housing more efficient trading desks, which enable funds to trade more due to lower trading-cost-constraints (see Cici, Dahm, and Kempf (2014)). The negative effect of past performance on trading activity is consistent with the view that poorly performing funds trade more heavily in an attempt to catch up with the performance of their respective benchmarks and peers.

4.2 Portfolio similarity among family members

In this section we test the hypothesis that faster information dissemination within a fund family results in more portfolio overlap among the member funds. Intuitively, fast information diffusion would make the information sets of affiliated fund managers in the family more similar. A greater similarity of managers' information sets would then result in greater similarities across member fund portfolios characterized by larger portfolio overlaps across the member funds.

To test this hypothesis, we use two measures of portfolio overlap. First, following Elton, Gruber, and Green (2007), we calculate the portfolio overlap as the minimum portfolio weight of a given pair of funds that hold the same stock, summed over all stocks they hold in common. For each fund, we then calculate the average of the overlap with all other funds in the family. As our second measure of portfolio overlap, we calculate for a given fund how many other funds in the family hold the stocks held by that fund. More specifically, we calculate for each stock held by a specific fund the value-weighted average fraction of other funds in the family that also hold that stock. We call the first measure the minimum overlap measure and the second one the average overlap measure.

In the pooled OLS regressions from Table 8, we use the overlap measures as dependent variables. The main explanatory variables are *FID* and FID^{across} and we use the same control variables as in the previous sections. We also add quarter and style fixed effects and cluster standard errors at the fund level. Panel A of Table 8 presents results for the general information diffusion measure *FID* while Panel B provides results for the cross-unit information diffusion measure FID^{across}.

– Insert TABLE 8 approximately here –

Results from Table 8 provide strong support for our hypothesis that faster information diffusion makes fund managers of the same family more likely to trade similar stocks. In all model specifications, the coefficients on the variables capturing speed of information diffusion are statistically significant at the 1%-level and also important in economic terms. For example, the coefficient of 0.0323 in column 2 of Panel A means that the average overlap (according to the Elton, Gruber, and Green (2007) approach) is 3.23 percentage points higher in families with a high speed of information diffusion relative to families with a low speed of information diffusion. Given that low *FID* families have an average minimum overlap of 12.9 percentage points, this difference is quite big in economic terms. Looking at the coefficients in the other model specifications provides the same conclusion.

4.3 Portfolio similarity with peer funds

Fast information diffusion across affiliated funds with different investment objectives is likely to increase the breadth of a manager's information set, causing her to gain insights into stocks that are not typical to her style universe. For this reason, we would expect that funds from families with fast cross-unit information diffusion to be more likely to hold stocks that are not typical to her style universe and, thus, have less overlap with the typical portfolio held by funds with the same investment objective (peer funds) outside their own fund family.

To test this hypothesis, we follow a similar approach as in the previous section. In particular, we construct two modified overlap versions. The first version is similar to the minimum overlap (Elton, Gruber, and Green (2007)). That is, for each fund and quarter, we calculate the portfolio overlap as a stock's minimum portfolio weight of the fund and an aggregated portfolio that consists of funds from the same investment objective, but from other families. The minimum portfolio weights are then summed over all stocks that the fund and the group of peer funds hold in common. The second overlap measure for a given fund is analogous to the average overlap of the previous section and is measured as the value-weighted fraction of funds from the peer group that also hold the stock. As in the previous section, we use these overlap measures as the dependent variables and the *FID* and FID^{across} measures as the main independent variables in separate multivariate regressions. Results are presented in Table 9.

– Insert TABLE 9 approximately here –

Table 9 results support our hypothesis that fast cross-unit information diffusion induces fund managers to hold portfolios that are less similar to portfolios of their peer group. While there is no significant effect for the general information diffusion measure *FID*, we find a significant impact for the cross-unit information diffusion measure FID^{across}. In other words, fast cross-unit information diffusion but not general information diffusion causes funds to deviate from their peers outside the own fund family. For example, the average minimum overlap with peers for funds from high FID^{across} families is more than one percentage point lower than the average minimum overlap of their counterparts from low FID^{across} after taking fund and family characteristics into account. This difference is not only statistically significant (at the 1%-level), but also economically relevant, since the average minimum overlap of funds in low FID^{across} families amounts to around 19 percentage points.

Taken together, results from the last two sections suggest that higher speed of information diffusion within fund families results in a greater interdependence of member funds in information production and utilization.

5 Summary and conclusion

In this paper we study how the speed with which information travels within a mutual fund family affects the performance and trading behavior of its member funds. We argue that timely information flows within the organization can help individual fund managers by increasing availability of information, generated by all members of the organization, in a timely fashion. Employing an intuitive measure to quantify the speed of information diffusion within mutual fund families that traces the sequence of mutual fund trades following the introduction of new information in the family, we document that mutual funds benefit from significantly better performance when information is transmitted faster within their corresponding families. Furthermore, our tests based on an exogenous shock to the information environment of mutual funds suggest a causality link between speed of information diffusion and fund performance.

We document that fast dissemination of information has a greater impact on fund performance when information flows across units rather than within units. This is consistent with the notion that cross-unit rather than within-unit information transfers can increase the information that is available to managers since there is a higher level of complementarity in the skills, knowledge, and expertise of managers from different units.

Taken altogether, our performance results have implications for the organizational structure of mutual fund families. They suggest that mutual fund families could benefit the performance of their member funds by removing formal or informal barriers that slow down information transfers within their organization.

Besides affecting the performance of mutual funds, fast information dissemination within fund families appears to also affect the trading behavior of the member funds. Consistent with fast information diffusion across units increasing the frequency of updates in the information sets of portfolio managers, we document that funds from families with fast information dissemination are more active traders. Also consistent with fast information diffusion across units affecting the type of information available to portfolio managers, we document that funds from families with fast information dissemination are more likely to hold stocks that differ from those held by their peers but are more likely to hold the same stocks as their affiliated funds. These results suggest that a higher speed of information diffusion within mutual fund families leads to a greater interdependence of affiliated mutual fund managers in information production and utilization.

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Table 1 – Summary statistics

This table reports summary statistics at the family and fund level for the total sample (All) as well as for high and low *FID* families. All observations are on a quarterly basis. *Family size* is the total net assets under management of the fund family in millions of dollars. *Number of stocks in family portfolio* represents the number of distinct stocks in the family per report date. *New stocks in family portfolio* is the number of distinct stocks that are newly purchased in the family relative to the number of stocks in the family at the previous report date. *Number of funds* represents the number of funds within a fund family and number of objectives, is the number of distinct investment objectives (CRSP Style Codes) followed by funds of the family. *Fund size* gives the total net assets under management in millions of dollars and *fund age* is shown in years. *Number of stocks in fund portfolio* represents the number of distinct stocks held by the fund at the report date. *Portfolio concentration* is the Herfindahl-Index of a fund's stock portfolio, measured as the sum of squared portfolio weights of each stock. *Turnover ratio* is fund turnover, defined as the minimum of security purchases and sales divided by the average total net assets under management during the calendar year. *Expense ratio* represent funds' fees charged for total services. *Carhart alpha* is the annualized fund performance calculated with the model of Carhart (1997) using both gross-of-fee returns and net-of-fee returns, respectively. The last column of the table reports the difference in fund family and fund characteristics between high and low *FID* families. ***, **, * denote statistical significance for the difference in means between both groups at the 1%, 5%, and 10% significance level, respectively.

	All	**High *FID***	**Low *FID***	**Difference**	
Family characteristics:					
Family size in million USD	18,498	18,889	18,113	776	
Number of stocks in family portfolio	656.19	681.28	631.49	49.79	**
New stocks in family portfolio (%)	16.53	18.38	14.70	3.68	***
Number of funds	11.42	12.64	10.21	2.43	***
Number of objectives	4.00	4.06	3.94	0.12	***
Fund characteristics:					
Fund size in million USD	1,711	1,585	1,861	-276	***
Fund age	16.12	16.22	15.99	0.23	
Number of stocks in fund portfolio	132.35	144.24	117.91	26.33	***
Portfolio concentration (*100)	2.03	1.97	2.09	-0.12	***
Turnover ratio (%)	86.82	95.36	76.66	18.70	***
Expense ratio (%)	1.20	1.20	1.20	0.00	
Carhart alpha (%) based on gross returns	0.80	1.04	0.48	0.56	***
Carhart alpha (%) based on net returns	-0.40	-0.12	-0.68	0.56	***

Table 2 – Speed of information diffusion and mutual fund performance

This table presents results from pooled OLS regressions that analyze the impact of information diffusion on mutual fund performance in the next quarter using three different performance measures: Jensen (1968) 1-factor alpha, Fama-French (1993) 3-factor alpha, and Carhart (1997) 4-factor alpha. Results are reported in gross-of-fee returns. The main independent variable is the speed of information diffusion (*FID*) measure for the family of the fund. We run separate regressions for the continuous variable as well as the *FID* dummy, which equals one if the fund family's *FID* is above the median in a given quarter. Additional independent controls include fund size, fund age, turnover ratio, family size, and the fraction of new stocks in the family portfolio. Fund size represents the logarithm of the fund's total net assets under management (measured in millions of dollars). Fund age is the logarithm of the fund's age (measured in years). Turnover ratio is the fund's yearly turnover ratio, defined as the minimum of security purchases and sales divided by the average total net assets under management during the calendar year. Family size is the logarithm of the fund family's assets under management (measured in millions of dollars). New stocks in family is the number of distinct stocks that are newly purchased in the family relative to the number of stocks in the family at the previous report date. All independent variables are valid as of the end of the quarter preceding the fund performance calculation. Regressions are run with quarter and style fixed effects. p-values reported in parentheses are based on standard errors clustered by fund. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

	Fund performance											
Dependent variable:	Jensen alpha				Fama-French alpha				Carhart alpha			
FID	0.0921				0.1980	**			0.2696	***		
	(0.3831)				(0.0492)				(0.0066)			
High *FID*			0.0842	**			0.1383	***			0.1471	***
			(0.0126)				(0.0000)				(0.0000)	
Fund size	-0.0471	***	-0.0469	***	-0.0388	***	-0.0385	***	-0.0385	***	-0.0385	***
	(0.0003)		(0.0003)		(0.0013)		(0.0013)		(0.0013)		(0.0012)	
Fund age	0.1791	***	0.1788	***	0.1496	***	0.1494	***	0.1744	***	0.1743	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Turnover ratio	0.0229		0.0174		-0.0149		-0.0218		0.0025		-0.0022	
	(0.4159)		(0.5357)		(0.5840)		(0.4219)		(0.9219)		(0.9328)	
Family size	0.0268	**	0.0240	*	0.0204		0.0167		0.0224	*	0.0198	
	(0.0355)		(0.0564)		(0.1081)		(0.1819)		(0.0721)		(0.1070)	
New stocks in family	0.0229		0.0171		-0.1015		-0.1071		-0.1407	*	-0.1416	*
	(0.7783)		(0.8325)		(0.1858)		(0.1623)		(0.0693)		(0.0676)	
Quarter fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Style fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	33,769		33,769		33,769		33,769		33,769		33,769	
Adj. R-Squared	0.1382		0.1384		0.1077		0.1081		0.0910		0.0912	

Table 3 – Determinants of the speed of information diffusion within a fund family

This table presents results from pooled OLS regressions that analyze the impact of different family characteristics on the fund family's speed of information diffusion. The dependent variable is the speed of information diffusion (*FID*) measure for the fund family in a given quarter. Our main independent variables are oursourcing ratio, number of managers, and interconnectedness. Outsourcing ratio is the fraction of funds in the family that are outsourced to subadvisors. Number of managers represents the logarithm of the number of distinct managers within the family. Interconnectedness is the density of the manager network, calculated as the number of actual connections between two managers divided by the number of potential connections within the family. A connection between two managers exists if they manage at least one fund together. Additional independent controls include the number of funds in the family, the average fund age, and family focus. Number of funds represents the logarithm of the number of funds in the fund family. Average fund age represents the logarithm of average fund age across all funds in the family (measured in years). Family focus is the concentration of family assets across all investment objectives, defined as in Siggelkow (2003). All independent variables are valid as of the quarter for which *FID* is calculated. Regressions are run with quarter fixed effects. p-values reported in parentheses are based on standard errors clustered by fund family. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Dependent variable:	*FID*		*FID*		*FID*		*FID*	
Number of funds	0.0565	***	0.1071	***	0.0710	***	0.1074	***
	(0.0026)		(0.0000)		(0.0003)		(0.0000)	
Avg. fund age	-0.0296		0.0039		0.0164		-0.0073	
	(0.3016)		(0.8777)		(0.5875)		(0.7881)	
Family focus	0.1203		0.0600		0.0273		0.0390	
	(0.1713)		(0.5010)		(0.7642)		(0.6682)	
Outsourcing ratio	-0.1128	***					-0.0674	*
	(0.0016)						(0.0785)	
Number of managers			-0.0574	***			-0.0448	**
			(0.0021)				(0.0184)	
Interconnectedness					0.1498	**	0.1008	*
					(0.0116)		(0.0935)	
Quarter fixed effects	Yes		Yes		Yes		Yes	
Number of observations	3,215		3,197		3,159		3,159	
Adj. R-Squared	0.0571		0.0558		0.0410		0.0850	

Table 4– Speed of information diffusion and the performance of active and index funds

This table presents results from pooled OLS regressions that analyze the impact of information diffusion on mutual fund performance in the next quarter using three different performance measures: Jensen (1968) 1-factor alpha, Fama-French (1993) 3-factor alpha, and Carhart (1997) 4-factor alpha. Results are reported in gross-of-fee returns. The main independent variable is the speed of information diffusion (*FID*) measure for the fund family. We run separate regressions for the continuous variable as well as the *FID* dummy, which equals one if the fund family's *FID* is above the median in a given quarter. We analyze the slope of the *FID* measures using two binary variables Active and Index. Active equals one if a fund is defined as actively-managed and zero otherwise. In contrast, Index equals one if the fund is an index fund and zero otherwise. Additional independent controls include fund size, fund age, turnover ratio, family size, and the fraction of new stocks in the family portfolio. Fund size represents the logarithm of the fund's total net assets under management (measured in millions of dollars). Fund age is the logarithm of the fund's age (measured in years). Turnover ratio is the fund's yearly turnover ratio, defined as the minimum of security purchases and sales divided by the average total net assets under management during the calendar year. Family size is the logarithm of the fund family's assets under management (measured in millions of dollars). New stocks in family is the number of distinct stocks that are newly purchased in the family relative to the number of stocks in the family at the previous report date. All independent variables are valid as of the end of the quarter preceding the fund performance calculation. Regressions are run with quarter and style fixed effects. p-values reported in parentheses are based on standard errors clustered by fund. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Table 4– Speed of information diffusion and the performance of active and index funds (continued)

	Fund performance											
Dependent variable:	Jensen alpha				Fama-French alpha				Carhart alpha			
*FID**Active	0.0975				0.1963	**			0.2670	***		
	(0.3546)				(0.0496)				(0.0068)			
*FID**Index	-0.0120				-0.0850				0.0046			
	(0.9569)				(0.5697)				(0.9747)			
High *FID**Active			0.0850	**			0.1351	***			0.1447	***
			(0.0115)				(0.0000)				(0.0000)	
High *FID**Index			0.0144				0.0418				0.0804	
			(0.8754)				(0.4754)				(0.1518)	
Index	-0.1475		-0.0420		-0.0849		0.1410	***	-0.0838		0.1191	**
	(0.3719)		(0.5345)		(0.4632)		(0.0048)		(0.4571)		(0.0236)	
Fund size	-0.0481	***	-0.0477	***	-0.0370	***	-0.0364	***	-0.0371	***	-0.0367	***
	(0.0001)		(0.0001)		(0.0010)		(0.0012)		(0.0009)		(0.0010)	
Fund age	0.1773	***	0.1769	***	0.1434	***	0.1425	***	0.1677	***	0.1669	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Turnover ratio	0.0102		0.0060		-0.0027		-0.0078		0.0112		0.0077	
	(0.6651)		(0.7989)		(0.8984)		(0.7144)		(0.5826)		(0.7032)	
Family size	0.0274	**	0.0248	**	0.0176		0.0142		0.0200	*	0.0175	
	(0.0227)		(0.0369)		(0.1391)		(0.2269)		(0.0870)		(0.1282)	
New stocks in family	0.0188		0.0131		-0.1071		-0.1132		-0.1401	*	-0.1420	*
	(0.8100)		(0.8669)		(0.1465)		(0.1245)		(0.0595)		(0.0563)	
Quarter fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Style fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	36,327		36,327		36,327		36,327		36,327		36,327	
Adj. R-Squared	0.1322		0.1323		0.1030		0.1034		0.0867		0.0871	

Table 5 – Performance effect around changes in family affiliation

This table relates differences-in-differences in performance with differences-in-differences in *FID* around family-switching events. We compute the post- minus-pre-switch performance for a fund that is changing fund families and also compute a post- minus-pre-switch performance for a matched control group of funds that are not changing their fund family. The difference between the two post-minus-pre-switch values is the difference-in-differences in performance. We computed a difference-in-differences in *FID* in a similar fashion. The dependent variable is the difference-in-differences in performance and the key independent variable is the difference-in-differences in *FID*. The control group for each fund in the treatment group fulfills a propensity score matching on a vector of quarterly 4-factor alpha, fund age, fund size, family size, and style, all measured before the change date of the treated fund. We include time fixed effects in the calculation of the propensity scores and match exactly on the time-period. In Panel A, we choose the fund with the closest propensity score the control, while in Panel B, we choose up to five funds with the closest propensity scores in the control group. Fund performance is measured using the Jensen (1968) 1-factor alpha, Fama-French (1993) 3-factor alpha, and Carhart (1997) 4-factor alpha. Results are reported in gross-of-fee returns. Additional independent controls include fund size, fund age, turnover ratio, family size, and the fraction of new stocks in the family portfolio. Fund size is the logarithm of the fund's total net assets under management (measured in millions of dollars). Fund age is the logarithm of the fund's age (measured in years). Turnover ratio is the fund's yearly turnover ratio, defined as the minimum of security purchases and sales divided by the average total net assets under management during the calendar year. Family size is the logarithm of the fund family's assets under management (measured in millions of dollars). New stocks in family is the number of distinct stocks that are newly purchased in the family relative to the number of stocks in the family at the previous report date. All additional control variables are measured for the funds in the treatment group before the switch. The multivariate regressions are run with quarter and style fixed effects. p-values are reported in parentheses. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Panel A: One matching fund (nearest neighbor)

	Difference-in-differences in fund performance											
Dependent variable:	Diff-in-Diff Jensen				Diff-in-Diff Fama-French				Diff-in-Diff Carhart			
Diff-in-Diff *FID*	3.3666	**	3.9568	*	2.7214	***	3.2579	**	2.9528	***	3.3670	**
	(0.0431)		(0.0846)		(0.0095)		(0.0239)		(0.0061)		(0.0241)	
Fund size			-0.4633				-0.3774	*			-0.2773	
			(0.1858)				(0.0861)				(0.2224)	
Fund age			-0.3336				-0.8920				-1.1991	**
			(0.7106)				(0.1145)				(0.0408)	
Turnover ratio			-0.2185				0.3283				0.1970	
			(0.7893)				(0.5221)				(0.7105)	
Family size			-0.9565	*			-0.3334				-0.1866	
			(0.0786)				(0.3271)				(0.5958)	
New stocks in family			1.4335				1.1789				1.4520	
			(0.8272)				(0.7747)				(0.7334)	
Quarter fixed effects	No		Yes		No		Yes		No		Yes	
Style fixed effects	No		Yes		No		Yes		No		Yes	
Number of observations	256		256		256		256		256		256	
Adj. R-Squared	0.0121		0.0199		0.0224		0.0355		0.0254		0.0218	

Table 5 – Performance effect around changes in family affiliation (continued)

Panel B: Five matching funds

	Difference-in-differences in fund performance											
Dependent variable:	Diff-in-Diff Jensen				Diff-in-Diff Fama-French				Diff-in-Diff Carhart			
Diff-in-Diff *FID*	3.8791	***	5.7628	***	2.9000	***	3.9156	***	3.0426	***	4.0851	***
	(0.0027)		(0.0016)		(0.0016)		(0.0020)		(0.0009)		(0.0013)	
Fund size			-0.5590	**			-0.3864	**			-0.3408	*
			(0.0275)				(0.0282)				(0.0522)	
Fund age			0.1861				-0.3705				-0.7429	*
			(0.7740)				(0.4107)				(0.0992)	
Turnover ratio			0.2772				0.3707				0.4130	
			(0.6383)				(0.3655)				(0.3126)	
Family size			-0.8734	**			-0.6381	**			-0.5464	**
			(0.0276)				(0.0205)				(0.0465)	
New stocks in family			0.2296				-0.3396				0.1981	
			(0.9613)				(0.9177)				(0.9519)	
Quarter fixed effects	No		Yes		No		Yes		No		Yes	
Style fixed effects	No		Yes		No		Yes		No		Yes	
Number of observations	256		256		256		256		256		256	
Adj. R-Squared	0.0310		0.0568		0.0348		0.0977		0.0392		0.0905	

Table 6 – Speed of information diffusion within and across objectives

This table presents results from pooled OLS regressions that analyze the impact of information diffusion on mutual fund performance in the next quarter using three different performance measures: Jensen (1968) 1-factor alpha, Fama-French (1993) 3-factor alpha, and Carhart (1997) 4-factor alpha. Results are reported in gross-of-fee returns. In Panel A, we construct *FID* based on buy and sell decisions by funds within the same objective in the fund family. In Panel B, *FID* is based on buy and sell decisions made by funds across different investment objectives. We run separate regressions for the continuous variable as well as the high *FID* dummy, which equals one if the fund family's *FID* is above the median in a given quarter. Additional independent controls include fund size, fund age, turnover ratio, family size, and the fraction of new stocks in the family portfolio. Fund size represents the logarithm of the fund's total net assets under management (measured in millions of dollars). Fund age is the logarithm of the fund's age (measured in years). Turnover ratio is the fund's yearly turnover ratio, defined as the minimum of security purchases and sales divided by the average total net assets under management during the calendar year. Family size is the logarithm of the fund family's assets under management (measured in millions of dollars). New stocks in family is the number of distinct stocks that are newly purchased in the family relative to the number of stocks in the family at the previous report date. All independent variables are valid as of the end of the quarter preceding the fund performance calculation. Regressions are run with quarter and style fixed effects. p-values reported in parentheses are based on standard errors clustered by fund. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Panel A: Information diffusion within objectives

	Fund performance					
Dependent variable:	Jensen alpha		Fama-French alpha		Carhart alpha	
FID^{Within}	-0.0067		0.0650		0.0714	
	(0.9366)		(0.4294)		(0.3569)	
High FID^{Within}		0.0389		0.0432		0.0567 *
		(0.2597)		(0.1889)		(0.0778)
Fund size	-0.0479 ***	-0.0470 ***	-0.0395 ***	-0.0391 ***	-0.0400 ***	-0.0393 ***
	(0.0002)	(0.0003)	(0.0010)	(0.0012)	(0.0008)	(0.0011)
Fund age	0.1846 ***	0.1838 ***	0.1521 ***	0.1514 ***	0.1787 ***	0.1777 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Turnover ratio	0.0327	0.0285	-0.0073	-0.0089	0.0122	0.0096
	(0.2456)	(0.3128)	(0.7888)	(0.7448)	(0.6351)	(0.7105)
Family size	0.0274 **	0.0247 *	0.0232 *	0.0219 *	0.0277 **	0.0256 **
	(0.0315)	(0.0528)	(0.0689)	(0.0881)	(0.0266)	(0.0414)
New stocks in family	0.0019	-0.0026	-0.0552	-0.0537	-0.0944	-0.0937
	(0.9819)	(0.9759)	(0.4861)	(0.4951)	(0.2304)	(0.2332)
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Style fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	33,349	33,349	33,349	33,349	33,349	33,349
Adj. R-Squared	0.1391	0.1391	0.1083	0.1083	0.0907	0.0908

Table 6 – Speed of information diffusion within and across objectives (continued)

Panel B: Information diffusion across objectives

	Fund performance											
Dependent variable:	Jensen alpha				Fama-French alpha				Carhart alpha			
FID^{Across}	0.2312	**			0.2959	***			0.3536	***		
	(0.0321)				(0.0047)				(0.0003)			
High *FID*^{Across}			0.1434	***			0.1518	***			0.1365	***
			(0.0000)				(0.0000)				(0.0000)	
Fund size	-0.0479	***	-0.0488	***	-0.0400	***	-0.0410	***	-0.0402	***	-0.0411	***
	(0.0002)		(0.0002)		(0.0008)		(0.0006)		(0.0007)		(0.0005)	
Fund age	0.1793	***	0.1788	***	0.1499	***	0.1496	***	0.1747	***	0.1749	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Turnover ratio	0.0169		0.0102		-0.0181		-0.0233		0.0003		-0.0010	
	(0.5463)		(0.7163)		(0.5031)		(0.3877)		(0.9895)		(0.9683)	
Family size	0.0262	**	0.0231	*	0.0214	*	0.0188		0.0241	**	0.0230	*
	(0.0353)		(0.0645)		(0.0838)		(0.1313)		(0.0455)		(0.0588)	
New stocks in family	0.0231		0.0175		-0.0938		-0.0983		-0.1288	*	-0.1304	*
	(0.7741)		(0.8289)		(0.2214)		(0.2012)		(0.0978)		(0.0942)	
Quarter fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Style fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	33,750		33,750		33,750		33,750		33,750		33,750	
Adj. R-Squared	0.1383		0.1386		0.1077		0.1081		0.0911		0.0912	

Table 7 – Speed of information diffusion and trading intensity

This table presents results from pooled OLS regressions that analyze the impact of information diffusion on a fund's turnover in the current year and current quarter, respectively. Annual turnover is the fund's annual turnover ratio, defined as the minimum of security purchases and sales divided by the average total net assets under management during the calendar year. Quarterly turnover is the minimum of the dollar value of purchases and sales in a given quarter divided by the average of the total portfolio value at the beginning and end of the quarter, defined as in Carhart (1997). Ratio of initiating buys is the fraction of stocks in a fund's portfolio that have been added in the current quarter, relative to the number of stocks at the beginning of the quarter Ratio of terminating sales is the fraction of stocks in a fund's portfolio that have been eliminated in the current quarter, relative to the number of stocks at the beginning of the quarter. *FID* and FID^{Across}, are described in Tables 2 and 6, respectively. Additional independent controls include fund size, squared fund size, fund age, past fund flows, past fund performance, and family size. Fund size represents the logarithm of the fund's total net assets under management (measured in millions of dollars). Fund age is the logarithm of the fund's age (measured in years). Fund flows represents the growth rate of money over the previous 12 months. Past fund performance represents the 4-factor alpha (gross-of-fees) estimated over the past 24 months. Family size is the logarithm of the fund family's assets under management (measured in millions of dollars). All control variables except *FID* are valid at the beginning of the period (year or quarter, respectively), for which we calculate turnover. Regressions are run with time (year or quarter, respectively) and style fixed effects. p-values reported in parentheses are based on standard errors clustered by fund. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Table 7 – Speed of information diffusion and trading intensity (continued)

Panel A: General information diffusion

	Trading intensity							
Dependent variable:	Annual turnover (CRSP)		Quarterly Turnover (annualized)		Ratio of initiating buys		Ratio of terminating sales	
FID	0.7111 ***		0.3826 ***		0.1248 ***		0.1134 ***	
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
High *FID*		0.1863 ***		0.1086 ***		0.0349 ***		0.0312 ***
		(0.0000)		(0.0000)		(0.0000)		(0.0000)
Fund size	-0.0227	-0.0280	0.0068	0.0041	-0.0047	-0.0056	-0.0038	-0.0046
	(0.4212)	(0.3314)	(0.6365)	(0.7788)	(0.3698)	(0.2924)	(0.3747)	(0.2968)
Squared fund size	-0.0065 ***	-0.0063 ***	-0.0049 ***	-0.0048 ***	-0.0009 **	-0.0009 **	-0.0009 **	-0.0008 **
	(0.0058)	(0.0085)	(0.0001)	(0.0001)	(0.0357)	(0.0459)	(0.0209)	(0.0293)
Fund age	0.0965 ***	0.1011 ***	0.0588 ***	0.0598 ***	0.0074 *	0.0078 *	0.0150 ***	0.0153 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0706)	(0.0608)	(0.0000)	(0.0000)
Fund flows (prior 12 months)	0.0050 ***	0.0055 ***	-0.0005	-0.0003	0.0004	0.0005 *	0.0004 *	0.0004 **
	(0.0013)	(0.0010)	(0.2483)	(0.5548)	(0.1470)	(0.0853)	(0.0553)	(0.0230)
Past performance (prior 24 months)	-0.2088 ***	-0.2027 ***	-0.1427 ***	-0.1426 ***	-0.0467 ***	-0.0466 ***	-0.0433 ***	-0.0432 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Family size	0.0128	0.0166	0.0148 **	0.0167 ***	0.0026	0.0033 *	0.0059 ***	0.0065 ***
	(0.2314)	(0.1222)	(0.0163)	(0.0064)	(0.1466)	(0.0698)	(0.0008)	(0.0002)
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Style fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	8,577	8,577	27,738	27,738	27,738	27,738	27,738	27,738
Adj. R-Squared	0.1369	0.1255	0.1041	0.0986	0.0317	0.0298	0.0838	0.0777

Table 7 – Speed of information diffusion and trading intensity (continued)

Panel B: Information diffusion across objectives

	Trading intensity							
Dependent variable:	Annual turnover (CRSP)		Quarterly Turnover (annualized)		Ratio of initiating buys		Ratio of terminating sales	
FID^{Across}	0.6150 ***		0.3509 ***		0.0943 ***		0.0955 ***	
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
High *FID*^{Across}		0.1863 ***		0.1067 ***		0.0302 ***		0.0316 ***
		(0.0000)		(0.0000)		(0.0000)		(0.0000)
Fund size	-0.0239	-0.0246	0.0048	0.0041	-0.0052	-0.0055	-0.0044	-0.0047
	(0.4088)	(0.3932)	(0.7473)	(0.7825)	(0.3293)	(0.3096)	(0.3213)	(0.2946)
Squared fund size	-0.0067 ***	-0.0068 ***	-0.0049 ***	-0.0049 ***	-0.0009 **	-0.0009 **	-0.0009 **	-0.0009 **
	(0.0053)	(0.0043)	(0.0001)	(0.0001)	(0.0351)	(0.0352)	(0.0239)	(0.0244)
Fund age	0.0973 ***	0.0980 ***	0.0586 ***	0.0598 ***	0.0076 *	0.0079 *	0.0150 ***	0.0153 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0688)	(0.0593)	(0.0000)	(0.0000)
Fund flows (prior 12 months)	0.0051 ***	0.0056 ***	-0.0006	-0.0004	0.0004	0.0005 *	0.0004 *	0.0004 **
	(0.0005)	(0.0007)	(0.2052)	(0.4560)	(0.1510)	(0.0823)	(0.0715)	(0.0233)
Past performance (prior 24 months)	-0.2130 ***	-0.2101 ***	-0.1455 ***	-0.1446 ***	-0.0472 ***	-0.0470 ***	-0.0440 ***	-0.0439 ***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Family size	0.0188 *	0.0201 *	0.0179 ***	0.0180 ***	0.0040 **	0.0039 **	0.0069 ***	0.0068 ***
	(0.0791)	(0.0583)	(0.0035)	(0.0031)	(0.0302)	(0.0321)	(0.0001)	(0.0001)
Quarter fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Style fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	8,574	8,574	27,720	27,720	27,720	27,720	27,720	27,720
Adj. R-Squared	0.1283	0.1259	0.1027	0.0983	0.0289	0.0287	0.0783	0.0783

Table 8 – Speed of information diffusion and portfolio similarity among family members

This table presents results from pooled OLS regressions that analyze the impact of information diffusion on a fund's overlap with other family funds. Minimum overlap, is the average overlap of a fund with each of the other member funds in the family, where a fund pair's overlap is the minimum weight of a stock in the pair's portfolio summed over all stocks that the two funds have in common. Average overlap is the value-weighted fraction of other funds in the family holding the same stock. *FID* and FID^{Across} are described in Tables 2 and 6, respectively. Additional independent controls include fund size, squared fund size, fund age, past fund flows, past fund performance, and family size. Fund size represents the logarithm of the fund's total net assets under management (measured in millions of dollars). Fund age is the logarithm of the fund's age (measured in years). Fund flows represents the growth rate of money over the previous 12 months. Past fund performance represents the 4-factor alpha (gross-of-fees) estimated over the past 24 months. Family size is the logarithm of the fund family's assets under management (measured in millions of dollars). All control variables except *FID* are valid at the beginning of the quarter, for which we calculate the overlap measures. Regressions are run with quarter and style fixed effects. p-values reported in parentheses are based on standard errors clustered by fund. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Panel A: General information diffusion

	Portfolio overlap with family members							
Dependent variable:	Minimum overlap				Average overlap			
FID	0.1211	***			0.1506	***		
	(0.0000)				(0.0000)			
High *FID*			0.0323	***			0.0424	***
			(0.0000)				(0.0000)	
Fund size	-0.0225	***	-0.0234	***	-0.0341	***	-0.0352	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Squared fund size	0.0023	***	0.0023	***	0.0037	***	0.0037	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Fund age	0.0095	***	0.0098	***	0.0057		0.0061	
	(0.0078)		(0.0063)		(0.2040)		(0.1777)	
Fund flows (prior 12 months)	-0.0007	***	-0.0006	***	-0.0009	***	-0.0008	***
	(0.0000)		(0.0001)		(0.0000)		(0.0001)	
Past performance (prior 24 months)	-0.0005		-0.0003		0.0012		0.0014	
	(0.8965)		(0.9423)		(0.7920)		(0.7619)	
Family size	-0.0016		-0.0010		0.0105	***	0.0112	***
	(0.2351)		(0.4712)		(0.0000)		(0.0000)	
Quarter fixed effects	Yes		Yes		Yes		Yes	
Style fixed effects	Yes		Yes		Yes		Yes	
Number of observations	30,522		30,522		30,608		30,608	
Adj. R-Squared	0.2806		0.2658		0.3349		0.3236	

Table 8 – Speed of information diffusion and portfolio similarity among family members (continued)

Panel B: Information diffusion across objectives

	Portfolio overlap with family members							
Dependent variable:	Minimum overlap				Average overlap			
FID^{Across}	0.0624	***			0.0976	***		
	(0.0000)				(0.0000)			
High FID^{Across}			0.0158	***			0.0239	***
			(0.0000)				(0.0000)	
Fund size	-0.0229	***	-0.0230	***	-0.0346	***	-0.0348	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Squared fund size	0.0022	***	0.0022	***	0.0036	***	0.0036	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Fund age	0.0098	***	0.0101	***	0.0060		0.0063	
	(0.0073)		(0.0063)		(0.1985)		(0.1733)	
Fund flows (prior 12 months)	-0.0006	***	-0.0006	***	-0.0009	***	-0.0008	***
	(0.0001)		(0.0006)		(0.0000)		(0.0003)	
Past performance (prior 24 months)	-0.0006		-0.0002		0.0006		0.0013	
	(0.8703)		(0.9538)		(0.8918)		(0.7843)	
Family size	0.0001		0.0002		0.0123	***	0.0126	***
	(0.9561)		(0.8681)		(0.0000)		(0.0000)	
Quarter fixed effects	Yes		Yes		Yes		Yes	
Style fixed effects	Yes		Yes		Yes		Yes	
Number of observations	30,504		30,504		30,589		30,589	
Adj. R-Squared	0.2515		0.2471		0.3134		0.3062	

Table 9 – Speed of information diffusion and portfolio similarity with peer funds

This table presents results from pooled OLS regressions that analyze the impact of information diffusion on a fund's overlap with funds from the same investment objective and from other families (peer funds). Minimum peer overlap is the sum of minimum portfolio overlap of a fund with the aggregated portfolio of its peer funds, where a fund's minimum peer overlap is the minimum weight of a stock in the pair's portfolio summed over all stocks that the fund and its peers have in common. Average overlap is the value-weighted fraction of peer funds holding the same stock. *FID* and FID^{Across}, are described in Tables 2 and 6, respectively. Additional independent controls include fund size, squared fund size, fund age, past fund flows, past fund performance, and family size. Fund size represents the logarithm of the fund's total net assets under management (measured in millions of dollars). Fund age is the logarithm of the fund's age (measured in years). Fund flows, represents the growth rate of money over the previous 12 months. Past fund performance represents the 4-factor alpha (gross-of-fees) estimated over the past 24 months. Family size is the logarithm of the fund family's assets under management (measured in millions of dollars). All control variables except *FID* are valid at the beginning of the quarter, for which we calculate the deviation from the style. Regressions are run with quarter and style fixed effects. p-values reported in parentheses are based on standard errors clustered by fund. ***, **, * denote statistical significance at the 1%, 5%, and 10% significance level, respectively.

Panel A: General information diffusion

	Portfolio overlap with peer funds							
Dependent variable:	Minimum peer overlap				Average peer overlap			
FID	0.0111				-0.0052			
	(0.3496)				(0.4807)			
High *FID*			0.0035				-0.0006	
			(0.3596)				(0.7837)	
Fund size	-0.0047		-0.0048		-0.0021		-0.0020	
	(0.3008)		(0.2911)		(0.4434)		(0.4481)	
Squared fund size	0.0015	***	0.0015	***	0.0004	*	0.0004	*
	(0.0005)		(0.0004)		(0.0926)		(0.0924)	
Fund age	-0.0073		-0.0072		0.0011		0.0010	
	(0.1176)		(0.1187)		(0.7028)		(0.7122)	
Fund flows (prior 12 months)	-0.0001		-0.0001		0.0001		0.0001	
	(0.5206)		(0.5388)		(0.1611)		(0.1662)	
Past performance (prior 24 months)	-0.0301	***	-0.0301	***	-0.0137	***	-0.0137	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Family size	0.0065	***	0.0066	***	-0.0018		-0.0018	*
	(0.0005)		(0.0005)		(0.1006)		(0.0888)	
Quarter fixed effects	Yes		Yes		Yes		Yes	
Style fixed effects	Yes		Yes		Yes		Yes	
Number of observations	30,651		30,651		30,651		30,651	
Adj. R-Squared	0.3988		0.3988		0.6016		0.6015	

Table 9 – Speed of information diffusion and portfolio similarity with peer funds (continued)

Panel B: Information diffusion across objectives

	Portfolio overlap with peer funds							
Dependent variable:	Minimum peer overlap				Average peer overlap			
FID^{Across}	-0.0225	*			-0.0258	***		
	(0.0825)				(0.0007)			
High *FID*^{Across}			-0.0107	***			-0.0068	***
			(0.0035)				(0.0007)	
Fund size	-0.0047		-0.0046		-0.0020		-0.0020	
	(0.2965)		(0.3126)		(0.4505)		(0.4622)	
Squared fund size	0.0014	***	0.0014	***	0.0004	*	0.0004	*
	(0.0005)		(0.0006)		(0.0996)		(0.0983)	
Fund age	-0.0069		-0.0068		0.0013		0.0012	
	(0.1382)		(0.1420)		(0.6342)		(0.6571)	
Fund flows (prior 12 months)	-0.0001		-0.0001		0.0001		0.0001	
	(0.5998)		(0.5633)		(0.1226)		(0.1581)	
Past performance (prior 24 months)	-0.0297	***	-0.0296	***	-0.0133	***	-0.0135	***
	(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Family size	0.0071	***	0.0073	***	-0.0015		-0.0016	
	(0.0001)		(0.0001)		(0.1473)		(0.1359)	
Quarter fixed effects	Yes		Yes		Yes		Yes	
Style fixed effects	Yes		Yes		Yes		Yes	
Number of observations	30,632		30,632		30,632		30,632	
Adj. R-Squared	0.3993		0.4001		0.6039		0.6031	