Cross-Sectional Differences among Money Market Mutual Funds and Their Role in the Mutual Fund Family.

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Abstract

This study examines cross-sectional differences among money market mutual funds (MMMFs) in the context of the sponsoring fund family. While extant studies have shown that fund family characteristics impact the management of open-end equity mutual funds, results of this analysis find that fund family characteristics also have an effect on the management of MMMF assets, contributing to differences in the maturity of the fund holdings, expenses, and realized returns. We find that a MMMF is not just a transitional account with a short-term low-risk investment objective, but rather, plays a critical role within the fund family, often used as a cash center and to internally manage risk at the family level. This study also notes that the observed diversity in the number and types of MMMFs within fund families can be explained by differences in the other types of funds offered within the complex, and by the variety of investment objectives in non-MMMFs. Thus, differences in maturity, yield, and expenses in MMMFs can be explained by the variation in family-specific characteristics, including diversification and cash management strategies at the family level.

JEL Classifications: G11, G23, E43
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1. Introduction

Money market mutual funds (MMMFs) have existed for more than three decades with the first such funds being introduced in 1972. By 1984, 305 MMMFs existed, totaling nearly $270 billion in assets. Over the last two decades, MMMFs have grown to more than $2 trillion in assets across 993 funds, and comprise about 25% of U.S. open-end mutual fund assets as of 2005, according to the Investment Company Institute (ICI).

Even though MMMFs are second only to equity funds in terms of the dollar amount of assets in the mutual fund industry, the majority of the existing literature concentrates on equity funds. Many studies of open-end equity funds examine how these funds differ in the cross-section and how these funds are affected by the characteristics of the sponsoring family. In contrast, there currently are only few studies of the cross-sectional differences among money market funds and no studies relating MMMF fund family characteristics.

Numerous studies focus on the skill of equity fund managers.[1] Although there is extensive literature on cross-sectional differences in performance and fund characteristics among equity mutual funds that examines management effectiveness in efficient markets, there are virtually no studies that address these issues in mutual funds that invest in fixed income securities, specifically MMMFs. As exemplified in Table 1, there are substantial differences in weighted average maturity, yields and expenses across MMMFs; however, relatively little research has been done to explain these cross-sectional differences. This despite the fact that MMMFs are second only to equity funds in their asset share of the mutual fund industry. This study extends the coverage of issues related to MMMFs.

In this study, we apply fund family characteristics similar to those that have been used to explain differences among equity funds to explain cross-sectional differences among MMMFs. Money-market mutual funds are not just transitional accounts with short-term low-risk investment objectives, but could play an important role within the fund family. As the family has its own objective function to maximize, it may use MMMFs to improve performance of the family in total with less destruction of performance to other funds in the family. Specifically, we examine the extent to which MMMFs are used within mutual fund families for the purposes of cash and risk

[1] See, for example, Elton et al (1993), Carhart (1997), Chevalier and Ellison (1997) among others.

management. We also examine the impact of clientele effects on the characteristics of the money market mutual fund.

Christoffersen (2001) studies the performance-flow relationship of MMMFs and how this relation affects decisions to waive fees. She employs Sirri and Tufano's (1998) methodology of estimating a piecewise-linear fund flow function and finds that better performers attract more flows, though poor performers do not experience outflows. Further, Christoffersen examines the decision to waive fees and finds that variation in fee waivers is significant and relates to the relative performance of the MMMF.

We examine whether MMMFs play the role of a family's internal cash center in which other funds in a family may perform their liquidity transactions using MMMFs. By using such cash management strategies, fund families can save on transaction costs at the family level by avoiding transactions with external entities when possible. Investors can also use MMMFs similarly, as they have an option of free asset transfer within the family without paying load fees. Thus, if family funds have high loads, then investors will likely prefer to stay in the family and use its MMMFs to temporarily "park" their cash before investing it elsewhere versus using sources outside the family for that need. In this study, we search for evidence of such investor and fund family behavior and its extent, based on fund family characteristics.

We also study the extent to which a family's risk may be internally managed using MMMFs by adjusting the maturities and risk of the funds' underlying securities, thereby adjusting the risk of the MMMFs. We expect that if fund families pursue such risk control strategies, then more concentrated families with less diversified portfolios and riskier funds with regard to other investment objectives will have less risky MMMFs, holding shorter maturity securities. The study explores the evidence of fund family risk control in conjunction with its MMMFs and suggests further explanations for fund behavior based on family characteristics.

Certain cross sectional differences among MMMFs within a family can also result from a clientele effect, e.g. a family with a larger variety of funds and investment objectives will more likely offer MMMFs with various characteristics in order to capture the heterogeneity of the family's investors. Massa (2003) finds evidence of family driven heterogeneity among funds and shows that families actively exploit it.

Our results demonstrate that MMMFs' returns are influenced by risk and maturity of MMMFs' portfolios, fund expenses, size, and macroeconomic factors. We find evidence that fund families and their investors use MMMFs as a cash center, and that fund families use MMMFs to internally manage risk at the family level. The observed diversity in the number and types of MMMFs in families can be explained by differences in the number of other type of funds offered within the complex, and by the variety in investment objectives of non-MMMFs in the fund family.

Thus, differences in fund characteristics, such as maturity, yield, and expenses across MMMFs can be explained by family-specific characteristics, including cash management and diversification strategies at the family level. Application of these strategies can reduce operating costs and improve overall performance at the family level.

The remainder of the paper is organized as follows: Section 2 develops the hypotheses and methodology for examining MMMFs. We provide a data description and empirical analyses in Section 3. Section 4 concludes the paper.

2. Cross-sectional examination of money market mutual funds

MMMFs offer to investors a relatively homogeneous product – short-term debt securities with relatively very low risk. Choice of securities that can be used in money market portfolios is also limited by regulations. Rule 2a-7 under Investment Company Act of 1940 specifies that money market funds will not acquire instruments with remaining maturity of greater than 397 days or will not maintain a dollar-weighted average portfolio maturity that exceeds 90 days. The rule also specifies portfolio quality and diversification that money market funds are to maintain, e.g. funds have to limit investments to securities with minimal credit risk, and invest no more than five percent of fund's total net assets in securities that are second tier securities or of single issuer. As the products are very similar we would expect very homogeneous characteristics among MMMFs, i.e. weighted average maturity, yields and expense ratios should not vary much, therefore, we would not expect very different strategies and different asset composition across money market funds.

Early research on MMMFs focuses on the portfolio manager's ability to predict interest rate fluctuations by examining the association between the portfolio's average maturity and interest rate changes. Ferri and Oberhelman (1981), and Packer and Pencek (1990) analyze aggregate data for changes in MMMFs' average maturity and subsequent changes in CD rates, finding evidence that managers, as a group, show some ability to predict future money market yields. Domian (1992), and Seyfried and Packer (2001) study the causality of the maturity-market yield relationship of MMMFs by utilizing Granger-causality tests and find that a relationship exists in the opposite direction from what was suggested by the previous studies. However, they still find that managers have ability to predict changes in short-term interest rates.

While these earlier studies examine time series variations of MMMFs' maturities, we focus on cross-sectional variation of the MMMFs' characteristics. Consistent with these earlier studies' conclusions that MMMFs are actively managed, we find that MMMFs do vary significantly in important characteristics, including maturity, return, and expenses. This implies that possibly these funds are not passive portfolios and they serve more purposes than just transitional accounts. Detailed analysis of the data is given in Section 3.

2.1. Factors of MMMFs' returns

Domian and Reichenstein (1997) examine the factors that affect the cross-section of net returns of MMMFs, and the persistence of relative returns across years, finding that the expense ratio is the most important factor in explaining difference between net returns, and that the MMMFs' relative returns show strong persistence. We examine additional factors and find that not only expenses determine cross-sectional variation of MMMFs' returns.

The main argument for observed differences in MMMFs' yields is that these funds pursue different levels of risk, as investors and/or fund family may use MMMFs for different purposes and may have different risk preferences. DeGennaro and Domian (1996) examine time-series differences in MMMFs' average maturity and conclude that managers select their target level for interest-rate risk. The question then is how managers decide what level of risk they are willing to take and what securities they will use in their portfolios to provide the return corresponding to the chosen risk. The choice of the risk and the return is obtained by selecting securities with different returns and maturities.

Returns are a composition of a risk free rate, default premium and maturity premium.[2] Therefore, returns can be altered by changing quality and/or maturity of securities. Adjustment of maturity premium was addressed in previous studies; however, these studies except DeGennaro and Domian (1996) did not look at it as a choice of asset composition rather than a response to expected rate changes.

Knez et al. (1994) identify the common factors that describe money market securities' returns by using both three- and four-factor models. Those factors are: (i) level factor, which represents movements in yields, (ii) steepness, which represents changes in steepness of yield curve, i.e. relation to maturity, (iii) Treasury factor, which captures credit risk in issues – credit risk in treasury issues and, for private issuer, it includes bank risk and firm risk. An additional factor is a private issue factor.

Even though common reasons for holding money market funds are liquidity and transaction services combined, MMMFs' investors may have some other reasons. For those that are concerned about safety of their investment, it is more appropriate to place their money in funds with a portfolio of government securities, accepting lower return.[3] For less risk-averse investors, higher returns in MMMFs with higher risk securities will be more attractive. As investors choose equity mutual funds in different categories based on their risk-return preferences, and funds offer these choices, similarly, different MMMFs are offered to satisfy different demands. This variety comes from a clientele effect, which is reflected in diverse asset composition of the portfolios.

We test MMMFs for the factors determining their returns that can explain cross-sectional differences of the funds, including risk and maturity of underlying securities. We predict that MMMFs with higher risk and higher weighted average maturity have higher return.

Based on Knez et al.'s (1994) return factors of money market securities, this prediction estimates second and third part of risk composition in return – risk (default) and maturity premiums. We employ the following model that includes cross-sectional fund and economy related factors:

[2] It is a composition of a debt security return, and since MMMFs use only debt securities in their portfolios we consider this structure.

[3] For extremely risk-averse investors the choice will be outside of mutual funds as banks offer money market accounts with FDIC insurance of up to $100,000.

$$r_{i,t} - r_{f_t} = \alpha + \beta_1 Risk_{i,t} + \beta_2 Maturity_{i,t} + \beta_3 Expenses_{i,t} + \beta_4 \log TNA_{i,t} + \beta_5 Inf_t + \varepsilon_{i,t} \quad (1)$$

where, dependent variable $r_{i,t}$ is the yearly gross return of the MMMF i in year t calculated by annualizing monthly returns reported in CRSP mutual fund database, and r_{ft} is the risk free rate available in the economy at the beginning of time t. $Risk_{i,t}$ is measured as a monthly return's standard deviation of the MMMF i in year t. $Maturity_{i,t}$ is a weighted average maturity of securities holdings of the MMMF i in year t measured in days. $Expenses_{i,t}$ and $logTNA_{i,t}$ are an expense ratio and the logarithm of total net assets of the MMMF i in year t respectively. Inflation in the economy, Inf_t, is calculated as the change of consumer price index from December of year t-1 to year t. $\varepsilon_{i,t}$ is the error term.

We expect β_1 and β_2 to be positive as the return should increase with risk and maturity premiums. The rest of the variables are controls and included for the following reasons. Expense ratio is a proxy for better management, and, as better services cost more, we expect the coefficient of this variable to be positive. MMMFs with higher expense ratios should have better performance in a form of higher return relative to other MMMFs. $logTNA_{i,t}$ is a proxy for the economy of scale, and its coefficient is expected to be positive as larger MMMFs can be more flexible in a choice of securities' maturities and would choose longer maturity translated into higher returns. Thus, $logTNA_{i,t}$ may be a proxy for maturity as well.[4]

Inflation is a macroeconomic factor, and its coefficient is expected to have a positive sign as a measure of the price change risk premium. Due to the Fisher's effect, risk free rate may not fully reflect inflation and there may be divergence between these two indicators, thus both are included in the model.

2.2. Family factors

Majority of MMMFs are offered by complexes, i.e. fund families that manage other types of funds as well.[5] As part of the complex, funds that have different objectives, e.g. growth, income, bond and others, have different risks, and may have different needs

[4] To test this effect we also run the model with exclusion of $logTNA_{i,t}$.

[5] There are cases where a family offers only one category of mutual funds, including only MMMFs, e.g. Centennial Capital Corporation offers only MMMFs. Also there are cases where families do not have MMMFs.

in cash when they face redemptions or inflows. Those risks and cash flows may interact among those funds in the complex.

Fund families can provide additional benefits to investors in form of potential for the economies of scale and scope, in terms of asset management as they have larger pool of managerial sources, distribution externalities and better research quality. A fund family also has its own utility function to maximize, which is related to fees generated from funds in the family. Thus, a fund family may engage in different strategies, such as cash management, risk management, and diversification, leading to different structures of MMMFs within the complex.

2.2.1. Cash management

Market transactions necessary to bring the fund cash level to the target are not free. It may be cheaper for fund managers to transfer cash and assets within a family through MMMFs, shifting the cash management function from the fund to the family level. Thus, it is possible to have no liquidity flows into or out of the family, and, therefore, no transaction costs. An anecdotal evidence of such strategy use is an example from Vanguard Funds family. In July of 2004 Vanguard launched a MMMF "available only to Vanguard funds and certain trusts and accounts managed by Vanguard".[6] Thus, the family created a special MMMF for cash management purposes at the family level.

The cash management strategy can work as the following. Let us suppose, an equity fund currently holds a target level of portfolio allocation including the level of cash, and, at the same time, it faces cash inflow as it sells shares to new investors. Before the manager of this fund will use this cash to adjust the fund portfolio holding to the target, he will put the cash in money market securities. A MMMF of the same family, when it faces redemption outflow, needs to sell money market securities to obtain cash. The funds can fulfill their needs by going to financial market outside the family or they can transfer assets within the family without incurring transaction costs. The latter one should be preferred. Therefore, in this type of transactions, MMMF's role is to fulfill cash needs not only of individual investors but also of other funds in the family. However, this pattern of fund flows is feasible if cash flows of the MMMF and the other

[6] Vanguard Market Liquidity Fund, Semiannual Report 2005.

funds of the family are highly negatively correlated or the MMMF holds very short maturity securities that provide cash on regular basis without a need to sell them and without incurring additional transaction costs.[7] Thus, the higher the flow volatility of other funds in the family the higher the level of cash needed by the funds to meet their liquidity needs, and therefore, if MMMFs play a role of family cash centers, the shorter the weighted average maturity of a MMMF.[8]

Depending on the level of cash flow correlation among funds in a family, MMMFs can play a different role. In the first scenario, all flows happen within a family and no cash leaves the complex; this is a closed system. For example, an equity fund had transfer of some amount to a bond fund, the bond fund had transfer to some other equity fund and the latter one transferred to a MMMF. In this case, when all cash flows can be offset, in order to avoid any transaction fees, complex should not sell and buy securities outside the family and all cash transfers should happen through a MMMF.

In the second scenario, there is an inflow to an equity fund and a manager of that fund places incoming cash into money market securities for some period of time.[9] At the same time, a MMMF of the same fund family experiences outflow. If the MMMF acts as a cash centre, then, instead of two outside transactions, there will be only one or none as money market securities can be moved to the equity fund in exchange for cash, which will be used to fulfill withholdings from the MMMF's shareholders. If the inflow and the outflow are perfectly correlated in time and absolute value, then no transaction is needed. However, if the flows are not perfectly offset, but at least some of the flows are correlated, then a part of them can be transferred within the family and the rest will incur transaction costs, still lower than the case with all transactions done outside the family.

However, if cash flows due to liquidity or portfolio rebalancing are one-sided, then flows of the equity fund (or the MMMF) cannot be offset and all of these flows will be transacted outside the family, and, therefore, will incur full cost. In cases when

[7] Though, holding securities with very short maturity may introduce additional transaction costs associated with reinvesting the cash.
[8] Chordia (1996) tests the hypothesis that cash and cash equivalents held by mutual funds increase with uncertainty about investor cash flows and cash flow volatility and finds that cash holdings increase with volatility.
[9] For simplicity, we ignore other funds in a complex; this does not change the logic and outcome of the strategy.

possible, using MMMFs as a cash center of a fund complex may reduce transaction costs, and, therefore, increase proceeds to the family.

Thus, families that have funds with higher flow volatility face elevated need in cash management. As a result, if families use MMMFs as a cash center, we predict that a family with funds of higher cash flow volatility has MMMF(s) with more volatile cash flows and, in the case when the family actively manages these flows, shorter maturity.

As correlations between family funds' flows and flows to MMMFs can be different across families, the flow volatilities and the asset compositions of the MMMFs are expected to differ, as are the extents to which MMMFs can be used as cash centers by the families. The following models are employed:

$$\begin{aligned} CFVolMMMF_{i,t} &= \alpha + \beta_1 CFVolFam_{i,t} + \beta_2 CFVolFam{*}CFCor_{i,t} + \beta_3 CFCor_{i,t} + \\ &\beta_4 Famturnover_{i,t} + \beta_5 logTNAmmf_{i,t} + \beta_6 logTNAfam_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

$$\begin{aligned} Maturity_{i,t} &= \alpha + \beta_1 CFVolFam_{i,t} + \beta_2 CFCor_{i,t} + \beta_3 Famturnover_{i,t} + \beta_4 logTNAmmf_{i,t} + \\ &\beta_5 logTNAfam_{i,t} + \beta_6 CFVolMMMF_{i,t} + \beta_7 FamilyHI_{i,t} + \beta_8 FamilyDiver_{i,t} + \\ &\beta_9 FamMMFCor_{i,t} + \beta_{10} RevMMF/RevFam_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{3}$$

where $CFVolMMMF_{i,t}$ is the volatility of MMMFs' cash flows in the family *i*, and $CFVolFam_{i,t}$ is the volatility of cash flows of the other funds in the family *i* calculated as a standard deviation of monthly cash flows in year *t*.[10, 11]

We predict a positive relation between cash flow volatility of MMMFs and of the family. If there is such a relation, then families as well as investors of the families use MMMFs as a cash center. In addition, if maturity is a tool to manage cash and liquidity, then it should be negatively related to the volatility of cash flows of the family and MMMFs. As volatility of the family's cash flows increases, managers would shorten the

[10] Cash flows to the MMMFs and to the family are calculated using Sirri and Tufano's (1998) methodology. We use monthly TNA and returns to construct net cash flows. The flows are calculated as: $Flow_{i,t} = TNA_{i,t} - TNA_{i,t-1} * (1 + R_{i,t})$, where TNA is MMMFs' or the rest of the family *i*'s total net assets at time *t*, and *R* is MMMFs' or the rest of the family's value weighted returns over the prior month.

[11] Christoffersen (2001) measures flows to MMMFs as a percentage change in assets, though she indicates that defining fund flows as $Flow_{i,t} = Assets_t - Assets_{t-1} * (1 + Net\,Returns_t) / Assets_{t-1}$ does not change the results of her study. Even though, Christoffersen's methodology may be justifiable for MMMFs, we use Sirri and Tufano's (1998) methodology because we need to have consistent measures of fund flows for all types of fund investment objectives.

maturity of MMMFs' securities to release more cash for liquidity purposes to avoid additional transaction costs.

$CFCor_{i,t}$ is the correlation between net cash flows to MMMFs and to the rest of the funds in the family *i*. $CFCor_{i,t}$ and interaction term $CFVolFam* CFCor_{i,t}$ are control variables that allow monitoring whether it is a closed system of cash flows. The rest of the variables are controls and explicitly defined in the models for risk management predictions below.

2.2.2. Loads and cash center

The previous discussion about the role of MMMFs in a fund family is from a family's and managers' point of view, i.e. how managers can optimize transactions in the family. On the other hand the MMMFs can play a role for an investor if this investor has account(s) in other funds of the family. It is quite possible that existence of a MMMF in a family may play no role for an investor who has a position in other accounts of the family, as the investor can liquidate the position when he wants to and place cash in a money market account anywhere else outside the family or vice versa. If funds other than MMMFs have front and/or back loads then an investor will face additional expenses from moving his money in or out the fund. However, these fees are omitted if investor's assets are moved within a family. Massa (2003) shows that the mutual fund families employ strategies that rely on the heterogeneity of the investors in terms of investment horizon by offering the possibility to switch across different funds belonging to the same family at no cost.

Thus, for liquidity purposes the MMMF in the family is more attractive to an investor than outside money market accounts. Chordia (1996) develops a model and finds empirical evidence at an individual fund level showing that redemption rates are higher in funds without load fees than in funds with fees and, therefore, cash holding decrease with load fees. We have a similar argument that there is a higher need for cash at the family level for a high load fund family as transfers will be within the family, not outside. Massa (2003) argues that investors who are planning to reallocate their assets more frequently will tend to invest in funds with lower load fees and in funds that belong to bigger families. We argue that families with higher average loads will experience more use of

MMMFs by investors as they will use MMMFs as transitional accounts within the family realizing the option of a free move.

We predict that a family with higher load funds has relatively larger MMMF(s) in the family, and a family with higher load funds has higher volatility of MMMF(s) cash flows. If investors move their assets between funds inside a family instead of through money market accounts outside the family as they are motivated by liquidity needs, then volatility of the family's MMMFs' cash flows is higher than of those of a family that do not restrain investors from leaving the family by charging loads.

Predictions are tested with the following models, which are similar to the Chordia's (1996) model of cash management tests at the fund level. Our tests are conducted at the family level, where total net assets of MMMFs play a similar role in the family as assets invested in cash in a single fund.

$$LIQ_{i,t} = \alpha + \beta_1 CFCor_{i,t} + \beta_2 AveFrontLoad_{i,t} + \beta_3 AveBackLoad_{i,t} + \beta_4 \log TNAfam_{i,t} + \varepsilon_{i,t} \quad (4)$$

$$CFVolMMMF_{i,t} = \alpha + \beta_1 CFCor_{i,t} + \beta_2 AveFrontLoad_{i,t} + \beta_3 AveBackLoad_{i,t} + \beta_4 logTNAfam_{i,t} + \beta_5 LogTNAMMMF_{i,t} + \varepsilon_{i,t} \quad (5)$$

where $LIQ_{i,t}$ represents family liquidity ratio.[12,13] $AveFrontLoad_{i,t}$ and $AveBackLoad_{i,t}$ are the value weighted average of front and back loads of the family i's funds in year t respectively.

We expect loads to be positively related to the family's liquidity ratio and to the volatility of the MMMFs' cash flows. However, if loads discourage investors from leaving the individual funds in the first place, and investors do not use the option of free asset transfer within the family, then the family will have less need for cash management of investors' flows through MMMFs, as loads will play that role at the fund level. Thus, loads would decrease the family liquidity ratio in a similar way as was reported by Chordia (1996) at the fund level. It is an empirical question whether investors are sensitive to loads and take advantage of the free asset transfer option within the family. The other variables are controls: the sizes of MMMFs and families as well as cash flow

[12] $LIQ_{i,t} = TNA_{MMMF_{i,t}} / TNA_{fam\,i,t}$

[13] Chordia (1998) measures liquidity ratio of a single fund as the cash and cash equivalents held by the fund as a percentage of the total assets. Our measure of family liquidity ratio is conceptually the same.

correlation may have impact on investors' decision to use the option of a free transfer or on a family's decision about money market securities allocation.

2.2.3. Risk management

There is a pool of literature that looks at risk taking strategies of mutual funds and at risk strategies in fund families. The latter studies are of more interest to this paper, and the main question they examine is whether fund families maximize their own utility function rather than pursuing the best risk adjusted return strategy for investors.

The agency problem creates risk taking behavior that is not necessarily in the best interest of an investor. Chevalier and Ellison (1997) among others show that non-linear convex shape of flow-performance relation (Sirri and Tufano (1998)) creates incentives for a fund manager to increase or decrease fund riskiness, which depends on the fund's year-to-date return. Managerial fees – revenues for a fund company, depend on the total assets under management, and, therefore, to maximize the fund utility function, the fund manager has an incentive to take actions that increase fund inflows from investors by changing risk or by other actions conflicting investors interests.

A conflict of interests may exist as family affiliation may influence the incentives of fund managers away from shareholders interests if whole family is going to benefit from that. Massa, Matos and Gaspar (2005), and Guedj and Papastaikoudi (2003) argue that families support better performing and/or higher fee funds to maximize proceeds to the family and, therefore, to maximize the family utility function. This family strategy of "favoritism" can be in a form of "cross-fund subsidization" by shifting performance across funds (Massa et al. (2005)) and limited resources allocation across funds (Guedj and Papastaikoudi (2003)). However, family utility function maximization can also be in a form of cash and risk management and diversification at the family level, which can reduce costs of running funds without disturbing performance of the funds in the family.

Massa (1998) develops a model of mutual fund industry structure explaining a role of fund families. He argues that as "…consumers pick the funds on the basis of the whole bundle of services they provide…" fund managing companies behave as multi-product firms. A fund family can provide risk hedging through category proliferation as it makes the overall portfolio of the fund family more diversified. It can be argued that, in an efficient market, an investor can achieve desired diversification on his own, so there is no need for a fund family to do that. Two explanations for family diversification exist. The first is that families offer other services that make diversification for an investor within a family more attractive than doing it on his own. The second is that a family may want to diversify in order to reduce its risk in a process of maximizing its own utility function. Thus, to attract more of investors' assets, families manage risk to capture more of different types of investors with various risk preferences, which also reflects in clientele effect discussed in the following section.

If a fund family is comprised of high risk securities, then, in order to offset the risk and to stabilize cash flows into the family, the family's MMMFs would hold less risky and shorter maturity securities. If a family has less risky types of funds in the family, then, in order to diversify a portfolio and to increase returns, MMMFs of this family would invest in higher return and/or longer maturity securities. We predict that risk and maturity of MMMF(s) of a fund family are negatively related to the risk of the family. Thus, differences in risk taking across MMMFs can come from diverse risk preferences of investors, from cross-sectional differences of a MMMF's return factors, and from risk diversification of a family portfolio.

Families have different degrees of concentration in a specific objective type as well as they have different number of fund objectives. We also control for a different risk correlation among funds in a family. For instance, a bond fund will have higher risk correlation with a MMMF as both use debt securities in their portfolios and are dependent on yield structure, and, thus, observe the same direction of risks. In contrast, if a family has mostly equity funds, then different objectives within equity funds may offset risks of each other. Therefore, the role of a MMMF for family risk control purposes is more important in a single fund type family or more concentrated family and in a family with less risk correlation.

As a fund family has a desire to capture as much of investor's assets as possible it would offer diverse set of funds in order to catch investors' heterogeneity. In a diversified family, investors need not to go outside the family for a diversification reason. Khorana and Servaes (2004) find that product differentiation is effective in obtaining market share. However, Elton, Gruber and Green (2005) suggest that a correlation between funds within a family may be higher than outside the family and the risk level in the family may be different from what can be obtained from family diversification.

To take into account the level of in-family correlation, diversification, and the risk correlation of the other funds with MMMFs, we propose the following to test a risk management strategy of the family. A family with more concentration in a single objective category has MMMF(s) with lower risk and shorter maturity. A family with higher positive correlation in risk between funds has MMMF(s) with lower risk and shorter maturity. Tests are based on the following models conducted at the family level:

$$Risk_{i,t} = \alpha + \beta_1 Familyrisk_{i,t} + \beta_2 Famturnover_{i,t} + \beta_3 \log TNAmmf_{i,t} + \beta_4 \log TNAfam_{i,t} + \varepsilon_{i,t} \quad (6)$$

$$Maturity_{i,t} = \alpha + \beta_1 Familyrisk_{i,t} + \beta_2 Famturnover_{i,t} + \beta_3 \log TNAmmf_{i,t} + \beta_4 \log TNAfam_{i,t} + \varepsilon_{i,t} \quad (7)$$

where, $Risk_{i,t}$ and $Maturity_{i,t}$ are different from the variables used to test composition of MMMFs' returns. $Risk_{i,t}$ is the standard deviation of monthly value weighted average returns and $Maturity_{i,t}$ is the value weighted average maturity of all MMMFs in the family *i* in year *t*. $Familyrisk_{i,t}$ is the weighted average volatility of the *i* family's returns measured by finding monthly weighted average returns of the family portfolio, excluding MMMFs, and then calculating the standard deviation of that returns over the year *t*. $Famturnover_{i,t}$ is the value weighted average turnover of the family's portfolios, excluding MMMFs. $logTNAmmf_{i,t}$ and $logTANfam_{i,t}$ are the logarithm of total net assets of the MMMFs and of the family *i* respectively in year *t*.

Elton et al. (2003), Brown et al. (1996), Chevalier and Ellison (1999), and Kempf and Ruenzi (2004) use the volatility of monthly returns as a measure of risk. Chevalier and Ellison (1999) employ an ordinary least squares method (OLS) with risk as a dependent variable. We also use an OLS method on pooled data to test risk management predictions. GLM procedure controls for the family fixed effects of the panel data with family dummy variables. If families use MMMFs as a tool to control family risk, then for both equations we expect β_1 to be negative as higher risk families will choose lower risk and lower maturity MMMFs to diversify their portfolios. $Famturover_{i,t}$ is a control variable, and its higher value will require a lower maturity of MMMF's securities to free some cash and reduce transaction costs. $logTNAmmf_{i,t}$ and $logTANfam_{i,t}$ are controls.

To test risk management predictions controlling for diversification and correlation we also incorporate risk correlation between family funds and MMMFs, diversification of the family, and concentration of the family within specific objective type.

$$\begin{aligned} Risk_{i,t} = \alpha + \beta_1 Familyrisk_{i,t} + \beta_2 Famturnover_{i,t} + \beta_3 \log TNAmmf_{i,t} + \\ \beta_4 \log TNAfam_{i,t} + \beta_5 FamilyHI_{i,t} + \beta_6 FamilyDiver_{i,t} + \beta_7 FamMMFCor_{i,t} + \\ \beta_8 RevMMF / RevFam_{i,t} + \beta_9 Familyrisk * FamMMFCor_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (8)$$

$$\begin{aligned} Maturity_{i,t} = \alpha + \beta_1 Familyrisk_{i,t} + \beta_2 Famturnover_{i,t} + \beta_3 \log TNAmmf_{i,t} + \\ \beta_4 \log TNAfam_{i,t} + \beta_5 FamilyHI_{i,t} + \beta_6 FamilyDiver_{i,t} + \beta_7 FamMMFCor_{i,t} + \\ \beta_8 RevMMF / RevFam_{i,t} + \beta_9 Familyrisk * FamMMFCor_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (9)$$

where, $Risk_{i,t}$ and $Maturity_{i,t}$ are at the family level as defined in the previous test. $FamilyHI_{i,t}$ represents family Herfindahl index that measures concentration of the family i in a specific objective besides MMMFs. The Herfindahl index is defined as the sum of the squares of the family funds' assets in each objective category as a proportion of the family's total assets.

$$FamilyHI_i = \sum_{j=1}^{N} \left(TNA_{ji} \Big/ \sum_{j=1}^{N} TNA_{ji} \right)^2 \quad (10)$$

where, TNA_{ji} is total net assets in fund's objective j in family i and N is the number of objective styles in family i. Based on the same reasoning for usage and on closeness of the sample periods we follow Massa (2003) and use ICDI_OBJ out of three potential sets of categories available in CRSP, which includes 23 different objectives. $FamilyHI_i$ equals one if a family has only one objective type across its funds and it is between zero and one when a family has more than one objective type.[14] Thus, the smaller the value of $FamilyHI_i$ the less concentrated the family.

Another proxy for family diversification is $FamilyDiver_{i,t}$. It is defined here as one minus a standard deviation of the residual (σ_ε) from Fama-French five-factor model that captures idiosyncratic risk that is not diversified away by a family portfolio. The larger

[14] We exclude MMMFs from Herfindahl index calculation and, therefore, it measures concentration in all other objectives but MMMFs, i.e. if a family has MMMFs and just one other objective then *FamilyHI* is equal to one in this case.

the value of σ_ε, the smaller the value of $FamilyDiver_{i,t}$ variable, the less diversified the portfolio. The model to obtain σ_ε is the following.[15]

$$R_t - RF_t = \alpha + \beta_1[RM_t - RF_t] + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 TERM_t + \beta_5 DEF_t + \varepsilon_t \quad (11)$$

$FamilyMMFCor_{i,t}$ measures risk correlation between the family *i*'s and MMMF's portfolios in year *t*. It is a correlation between monthly returns on MMMFs' portfolio and the value weighted returns on the family's portfolio, excluding MMMFs, in year *t*.

We also include as a control variable percentage of fee revenues generated by MMMFs relative to fee revenues of its whole family. The revenues are measured as an expense ratio multiplied by TNA. $Familyrisk*FamMMFCor_{i,t}$ is the interaction term included to control for the correlation effect on family risk. The rest of the variables are as defined before.

We expect a negative relationship between family concentration ($FamilyHI_{i,t}$) and risk level and maturity of MMMFs' portfolio in the family. A positive sign is expected on family diversification ($FamilyDiver_{i,t}$) variable, i.e. more diversified families will need less risk management through MMMFs. $FamilyMMFCor_{i,t}$ controls if there is a room for risk management, and is expected to be negative as lower correlation will allow more possibility for using diversification strategies.

2.2.4. Clientele

For transitional accounts and cash management, a family needs to have only one MMMF. Though, in reality, families have more than one, see Table 3.[16] The reason can be in the clientele effect among investors. Families have different MMMF categories and investment objectives, such as taxable and tax-exempt, retail and institutional.[17] Massa (2003) finds evidence of family driven heterogeneity among funds and shows that families actively exploit it. He argues that when it is very costly to compete on the

[15] Variables' definitions are the same as in Fama and French (1993). The two out of seven Fama and French's (1993) bond portfolios used as dependent variables in the excess return regressions are 5 year government bonds and corporate bonds rated Aaa.
[16] For example, Federated Securities Corporation family has 105 MMMFs, including share classes.
[17] Some examples of MMMFs' objectives, according to ICDI fund objective codes: MF – Money market Tax Free Funds invest in municipal obligations that are close to maturity, MQ – High Quality Municipal Bond Funds invest in municipal securities rated BBB or better, and others.

performance dimension alone, the family will focus on other ways of attracting investors, such as reducing fees or increasing the number of funds within the family.

As investors prefer different risks and as they pursue different strategies in their portfolios, they may need different levels of risk and return from MMMFs as well. Families that pursue a strategy of broad investor coverage in terms of fund investment objectives should have more MMMFs with different investment objectives. We predict that the more the number of fund styles in a family the more MMMFs with different characteristics and investment objectives are offered by the family.

This prediction is in line with the family risk management strategies, and is more pronounced for fund families with higher loads. The higher the number of funds in the family, the greater the value of the switching option, because the effective fees decrease as a function of the number of funds. Our OLS regression is estimated based on the following models, with control for the families' fixed effects:

$$\begin{aligned} Dependent_{i,t} = \alpha + \beta_1 FamObjNum_{i,t} + \beta_2 FamFundNum_{i,t} + \beta_3 AveFrontLoad_{i,t} + \\ \beta_3 AveBackLoad_{i,t} + \beta_4 \log TNAMMMF_{i,t} + \beta_5 \log TNAfam_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (12)$$

where we use several dependent variables: the number of MMMFs offered by the family *i* – $MMMFNum_{i,t}$, the number of MMMFs' investment objectives offered by the family *i* – $MMMFObjNum_{i,t}$, and Herfindahl index of MMMFs in the family *i* – $MMMFHI_{i,t}$.

$FamObjNum_{i,t}$ is the number of style objectives in the family *i*, excluding money market, and $FamFundNum_{i,t}$ is the number of funds in the family *i* besides MMMFs. The rest of the variables are as defined before. For the dependent variables $MMMFNum_{i,t}$ and $MMMFObjNum_{i,t}$, β_1 and β_2 are expected to be positive as more fund objectives and more funds in the family will indicate more investor heterogeneity, therefore, more MMMFs with different investment styles will be required. For the dependent variable $MMMFHI_{i,t}$, the sign is expected to be the opposite, as $MMMFHI_{i,t}$ measures the concentration, and its higher value indicates less variety in the family's MMMFs. The signs on loads should be the same as in loads effect in cash centers, indicating investors' use of other funds in the family. The rest of the variables are controls and are as defined before. Two of the dependent variables are count data, and, to overcome restriction of OLS assumption of continuous normal distribution of a dependent variable, we use Poisson regression model with these variables and control for the family fixed effects.

2.2.5. Family effects

In addition to cash and risk management, and clientele predictions, which try to explain cross-sectional differences across MMMFs, it is possible that a family has other specific effects that determine those differences. For example, the family can have generally higher expenses for all funds, and, therefore, MMMFs from that family would have higher level of expenses as well, compared to MMMFs from other families. These higher expenses should be compensated by higher returns, as funds that show better performance achieved through better management require higher fees for that expertise.

We predict that the higher the average levels of expense ratios in a family the higher the expense ratios in MMMFs of that family. A MMMF with higher expense ratio should show better performance in form of higher gross return relative to other MMMFs, controlling for maturity of underlying assets.

Test of the first part of this prediction is combined with the return composition test defined above. The second part is tested at a fund level as the following.

$$Expenses_{i,t} = \alpha + \beta_1 AveExpensesFam_{i,t} + \beta_2 LogTNAMMMF_{i,t} + \beta_3 LogTNAfam_{i,t} + \varepsilon_{i,t} \quad (13)$$

where, $Expenses_{i,t}$ is the MMMF's i and $AveExpensesFam_{i,t}$ is the rest of the family's value weighted average expense ratios. β_1 is expected to be positive, reflecting overall family strategies in fee setting. The other variables are controls.

3. Data description and empirical results

Primary source of the data is the Center for Research in Security Prices (CRSP) survivor-bias free US mutual fund database. We limited the study period to 1992-2004 because CRSP data have many missing observations prior to 1992. Net asset value equal to one is used to identify MMMFs.[18] We dropped the fund observations with total net assets less than \$10 million, leaving 13,427 fund-year observations of MMMFs. Descriptive statistics of the money market mutual fund-year data yearly and over entire period of the study is presented in Table 1. The data show that there is a substantial cross-sectional variation between the MMMFs in the variables presented in the table. For example, standard deviation of the weighted average maturity is 17 days with the mean

[18] We also check ICDI's fund objective code and portfolio holdings to be fully invested in cash.

(median) of 45 (46) days. A similar picture is observed for the expenses: standard deviation is 0.29% with the mean (median) of 0.60 (0.59)%, and for the gross return: standard deviation is 1.72% with the mean (median) of 3.75 (3.82)%.

Table 2 exhibits statistics of the number of MMMFs across families by year and for the entire sample period. Columns 2 and 3 report total numbers of families available in the mutual fund industry and of the families that have MMMFs respectively. Even though it may look like the families with MMMFs represent less than a half of the number of all families, Table 3 shows that, in terms of TNA, the families with MMMFs are larger and represent the majority of the mutual fund industry – they have more than 90 percent of the mutual fund industry asset share as of December 2004. It is noticeable that the average number of MMMFs in a family has increased from four to almost ten funds, and the median number has changed from two to four funds per family. The number of families that offer MMMFs varies over the years with a peak occurring in 2000, this can be explained by waves in the economy and popularity of different investment products.[19]

Most of the tests are for fund-family relations. Using the list of MMMFs that we obtained first, for our analysis, we selected all funds that were in the same family as the MMMF. Some of the families that were initially selected based on the presence of MMMFs did not have other types of funds; therefore, for the predictions that require families with other than money market funds, we dropped the MMMF-only families from the sample.[20]

Other sources of the data are as follows. Fama-French three factors were obtained from Wharton Research Data Services. Interest rates of securities with different maturities and ratings come from Federal Reserve Bank reports. Inflation rate is calculated from consumer price index (CPI) reported by US Department of Labor.

The first set of results is from the fund level tests excluding family effects. As we predicted, some of the differences in the MMMFs' characteristics can be explained by different risk-return strategies that MMMFs pursue. Table 5 reports the factors that affect returns to MMMFs. Coefficient on the $Risk_{i,t}$ variable is positive as expected and

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[19] The total number of families was the largest in 2000 as well.
[20] We require at least two investment objectives, including money market.

statistically significant at less than 1-percent level, though, maturity has almost zero effect. Coefficient on the $LogTNA_{i,t}$ variable has positive sign as expected confirming that there is an economy of scale effect similar to bond funds as reported by Philpot et al. (1998). Testing the model without $LogTNA_{i,t}$ does not confirm the assumption that the size of a MMMF can be a close proxy for maturity, as the coefficient of $Maturity_{i,t}$ does not change much.

Inflation has positive sign as expected. Expenses are positively related to gross returns, which is consistent with the prediction that funds with higher fees should have higher returns as fees should reflect managerial abilities. These results are statistically significant at less than 1-percent level.

The cash center predictions' results are reported in Table 6. As predicted, the cash flow volatility of the family and MMMFs are positively related at high level of significance. Cash flows correlation and interaction term of the family cash flow volatility and cash flow correlation, used as control variables for indication of open or closed system, are positively related to MMMFs' cash flow volatility, emphasizing the result of the main variable. Thus, there is an indication that families use MMMFs as a cash center by clearing appropriate cash and securities transactions within a family through MMMFs, and not outside the family.

If maturity of money market securities were used as means to conduct a cash management strategy then negative relationship between MMMFs' maturity and family cash flow volatility would be expected. Results for $CFVolFam_{i,t}$ variable in this model are not significant. Thus, even though families use MMMFs as cash centers, the test result does not indicate that families use active cash management strategy by controlling maturity of MMMFs' portfolio.

Family cash management activities performed through MMMFs may have some effect on expenses in MMMFs, as additional costs associated with these activities may exist. We test whether cash flow volatility of MMMFs affects their expense ratios.

Results reported in Table 7 show that expenses do not increase with MMMFs' cash flow volatility. Thus, benefits of these strategies may outweigh additional costs.[21]

Before examining how investors use the option of free asset move within a family, reflected in cash center activity, the level of MMMFs' assets across families is examined. As Table 4 reports, percentage of the TNA of MMMFs in the TNA of the family, identified here as a liquidity measure of the family, varies substantially across families. Specifically, the mean is 34.86% with standard deviation of 29.88%. Thus, there is cross-sectional variation in the level of "cash" allocation at the family level suggesting that families have different cash management strategies depending on family characteristics.

Results for load effect on a family liquidity ratio and cash flow volatility of MMMFs are reported in Table 8. With control for the family fixed effects, results indicate that front loads are positively related to the family liquidity ratio as expected. As investors pay their front load fees only once at the entry of the family, they choose to move their assets within the family. Therefore, there is more need for money market securities as transitional accounts within the family, and MMMFs serve that purpose for investors. Back loads have different effect. They are negatively related to the family liquidity ratio. It is possible that funds that impose back loads attract investors that have long-term investment horizon. Chordia (1996) suggests that there is separation between investors that trade in and out of a fund often and those who stay for a long period of time. Precisely, lower turnover investors choose funds with loads to avoid loss in value to actively trading investors. Therefore, there is self selection among investors. Thus, back loads attract long term investors who do not intend to trade out of the fund, and higher back loads discourage short-term investors who would use family cash center for trading purposes.

The effect of loads on MMMFs' cash flow volatility is following. When loads are separated into front and back ones then results are not conclusive as they lack statistical power. However, total loads of the family are positively related to MMMFs' cash flow volatility, which is consistent with our predictions. As higher loads make it more

[21] Though, even if there is a cost of running the cash management strategy at the family level, it cannot be passed onto individual investors of MMMFs. As the benefits are enjoyed by all family investors, thus, the costs can be reflected in the expense ratios of all funds in the family.

attractive for investors to move their assets within the family through the cash center so cash flow volatility of MMMFs increases.

Tests of the risk management hypotheses reveal the following picture. Results of univariate analysis of families without and with MMMFs presented in Table 3 indicate that families that do not have MMMFs have higher risk than families that do. Specifically, mean value of risk for the former ones is 4.2% with standard deviation of 2.9% versus mean value of risk for the latter ones, excluding MMMFs, is 3.1% with standard deviation of 2.2%. Even more, after MMMFs are included into calculation, mean value of a family risk becomes 2.2% with standard deviation of 2.1%. Thus, there is self-selection of the families in terms of risk, and families that have MMMFs are less risky and they do use money market funds to control their risk. Differences in means are statistically significant at less than 1-percent.

Results of more tests of the risk management strategies are reported in Table 9. Panel A has results for the first proxy of a dependent variable – standard deviation of MMMFs' returns, which measures overall risk of the money market portfolios. In Model 1 that tests risk management strategies, risk of MMMFs is positively related to the family risk with statistical significance at less than 1-percent level, which is in opposite of what was expected if families were to use MMMFs for the risk management strategies. Our explanation of the result is that families with higher level of risk choose higher risk for their money market funds as well. Though, univariate analysis indicates that families with MMMFs do have lower risk.

As reported in panel B, with maturity as a dependent variable, the coefficient on the family risk is negative, as expected, with significance at 10-percent level for OLS regression.[22] Maturity measures part of the overall risk and this result indicates that families perform some risk management strategies through adjusting maturity of money market portfolios. Results for the control variables have following explanation. Family turnover is negatively related to maturity, indicating that, as turnover increases, families control increased trading activity with shortening maturity of MMMFs. Size of MMMFs is positively related to maturity showing that larger money market funds can afford to

[22] When we control for the family fixed effects, power of some of the variables in the test diminishes.

have longer maturity of their portfolios as they may have more liquidity due to different expiration of their holdings.

The results of the tests for family concentration and the level of family diversification are reported in both panels under Model 2. We expect that the risk management strategies are more required for more concentrated and less diversified families, and they are more feasible with MMMFs whose risk is less correlated with the risk of the rest of the family's portfolio. Panel A reports results for the overall risk dependent variable where the results for common variables are consistent with those of the Model 1. We find that MMMFs' risk is positively related to the family diversification, as expected, and it is highly significant at less than 1-percent level, indicating that more diversified families have less need to employ diversification and risk management strategies through MMMFs, and vice versa. Correlation between MMMFs' and the family risk is positive, which is consistent with the finding that MMMFs' and family risks are positively related.

Panel B reports similar results for the other risk proxy – maturity. The coefficients of family Herfindahl index ($FamilyHI_{i,t}$), diversification ($FamilyDiver_{i,t}$) and risk correlation ($FamMMFCor_{i,t}$) have signs as expected.[23] Concentration of a family is negatively related to $Maturity_{i,t}$, i.e. more concentrated families choose shorter MMMFs' maturity to control the family risk. The correlation between MMMFs' and family risk is negatively related to MMMFs' maturity, as expected, indicating that for the families with lower correlation it is more feasible to use MMMFs for the family risk management strategies.

Risk and cash management strategies may have effect on the level of family returns. We conduct univariate analysis of the value weighted family net returns for both types of families – with and without MMMFs. This approach limits the ability to separate effect of these strategies on the returns, so we can conclude only about joint effect. Table 3 shows that families without MMMFs on average have higher return than MMMF families, though it may be due to the fact that the former ones have a higher risk in their portfolios so they are compensated for that risk. Indeed, average level of risk in families without MMMFs is 4.17% versus 3.05 (2.22)% in families with excluding (including)

[23] Though, statistical power is lost for many variables when we control for the family fixed effects.

MMMFs. Risk and cash management strategies may generate higher risk adjusted returns. We can make some conclusions about the effect of cash management strategy by looking at the level of expense ratio. Families that have MMMFs, on average, have lower expense ratios (1.00% - including, and 1.14% - excluding MMMFs versus 1.40% - without MMMFs), which may be achieved by reduction in transaction costs.

Results of the clientele tests are reported in Table 10. To check for the robustness of the results, we perform both OLS and Poisson with the family fixed effects, where latter ones are specifically designed for count data tests. Results show that there is a clientele effect in the families, which is reflected in the number of MMMFs and their investment objectives. The number of funds and the number of investment objectives in a family are both positively related to the number of MMMFs offered by the family. When we use the number of MMMF objectives as a dependent variable, then the number of family objectives is also positively related to it, though, the total number of funds offered by the family has mixed results. We can infer that, as there is more investor heterogeneity in fund families, the families offer more MMMFs of different styles to meet investors' needs. This is an indication of clientele effect. Use of MMMFs' Herfindahl index as a dependent variable gives results consistent with the above findings.

Final set of analyses tests whether family characteristics determine cross sectional differences of MMMFs in expenses and other variables. Table 7 shows that the family level of expense ratios determines those of the MMMFs in the family. The coefficient on the value weighted average expense ratio of the family is positive and highly significant, which is consistent with the prediction. Also, we find, as reported in Table 5, that expense ratios of MMMFs are positively related to gross returns of the funds, which is consistent with the prediction that higher fees are compensation for better management.

4. Conclusion

We examine cross-sectional differences of money market mutual funds during the period 1992-2004. We find evidence that fund families and their investors often use MMMFs as a cash center since family's cash flow volatility is positively related to MMMFs' cash flow volatility. In addition, we discover that loads affect a fund family's liquidity ratio, level of MMMFs' assets, and cash flow volatility of MMMFs. By using an option of free asset transfer within a family, investors assign MMMFs a function of a cash center within the family. The results of this study demonstrate that front and back loads play different roles in discouraging investors from moving their assets in or out at the fund level, and, therefore, different roles for cash management tasks at the family level. Investors in funds with back-end loads tend not to use MMMFs for transitional purposes within the family. These results are consistent with the self-selection of investors in Chordia (1996), in which back-end loads attract only investors who do not intend to move their assets, even within a family. In contrast, front loads have the opposite effect, confirming our predictions that they have a positive relationship with a family's liquidity ratio. Thus, the cash management function is shifted from the fund level to the family level. Total loads are also positively related to MMMFs' cash flow volatility, which confirms the cash management predictions.

We find that MMMFs' returns are determined by risk factors such as risk of MMMFs' portfolios, expenses and size of funds, and macroeconomic factors. This provides a glimpse of what influences the observed cross-sectional differences in MMMFs' returns at the fund level. In addition, our results suggest that fund families use MMMFs for risk management purposes. Univariate analysis shows that families with MMMFs have lower risk than those without MMMFs. Using two proxies for the risk measure – standard deviation of MMMFs' returns and maturity of MMMFs' portfolios – in regression analysis, we find that MMMFs' risk decreases as families are less diversified and more concentrated.

We check for a clientele effect in the effort to explain variety in MMMFs and their investment styles across families. This variety is explained by the diversity in the numbers and investment objectives of the family's other funds. We can conclude that families with more investor heterogeneity offer more MMMFs, of different types to meet investors' needs. This is an indication of the clientele effect.

Family characteristics also determine cross-sectional differences of MMMFs with regard to expenses. We find that MMMFs' expenses are positively related to the value weighted average expenses of the family, and that expense ratios of MMMFs' are positively related to gross returns of the funds.

Contrary to the perception that MMMFs are simply homogeneous transitional "cash" accounts, this paper finds that MMMFs play a larger role than one might expect within a mutual fund family. The characteristics of MMMFs differ substantially in the cross-section and these differences can be explained by family-specific characteristics, including diversification and cash management strategies at the family level. Application of these strategies can reduce operating costs and improve overall performance at the family level, which will translate into investor benefits.

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Table 1. Descriptive Statistics of the MMMFs.

The table reports descriptive statistics for 13,427 fund-year observations of the MMMFs during the 1992-2004 period. Data source is CRSP mutual funds. Variables: TNA – total net assets – measured in millions of dollars, Maturity – weighted average maturity – measured in days, Expenses – expense ratio – measured in percentage, Return – yearly gross return of MMMFs – measured in percentage, and Risk – standard deviation of monthly returns. N is the number of funds.

Year	Statistics	TNA, $ mln	Maturity, days	Expenses, %	Return, %	Risk, %
1992	Mean	623.1	52.8	0.64	3.71	0.04
N=679	Std Dev	1610.3	17.3	0.27	0.51	0.01
1993	Mean	628.4	39.6	0.61	3.03	0.01
N=740	Std Dev	1545.5	21.2	0.25	0.40	0.01
1994	Mean	566.2	48.1	0.60	3.85	0.06
N=665	Std Dev	1628.1	18.2	0.28	0.69	0.02
1995	Mean	648.7	46.3	0.60	5.33	0.02
N=812	Std Dev	1850.0	17.8	0.27	1.03	0.02
1996	Mean	672.3	45.8	0.60	4.88	0.02
N=991	Std Dev	1985.5	16.3	0.27	0.96	0.01
1997	Mean	822.3	46.7	0.59	5.00	0.02
N=1,138	Std Dev	2352.8	16.3	0.27	0.98	0.03
1998	Mean	1005.6	46.2	0.60	4.93	0.02
N=1,206	Std Dev	2964.1	15.1	0.30	1.01	0.04
1999	Mean	1167.0	48.8	0.61	4.58	0.03
N=1,201	Std Dev	3497.3	14.9	0.30	0.91	0.01
2000	Mean	1260.1	43.9	0.60	5.71	0.04
N=1,219	Std Dev	3684.2	15.2	0.30	1.10	0.02
2001	Mean	1534.5	43.6	0.62	3.82	0.09
N=1,207	Std Dev	4343.0	15.5	0.32	0.68	0.02
2002	Mean	1538.1	43.8	0.62	1.78	0.01
N=1,168	Std Dev	4281.6	15.0	0.33	0.20	0.01
2003	Mean	1333.5	48.0	0.60	1.21	0.01
N=1,365	Std Dev	3689.1	15.7	0.31	0.15	0.01
2004	Mean	1274.4	37.2	0.58	1.35	0.03
N=1,036	Std Dev	3610.2	16.2	0.27	0.11	0.01
1992-2004	Mean	1067.5	45.4	0.60	3.75	0.03
N=13,427	Std Dev	3203.5	16.7	0.29	1.72	0.03
	10^{th} Pctl.	33.5	24.7	0.24	1.26	0.01
	25^{th} Pctl.	86.7	35.5	0.43	1.95	0.01
	Median	261.5	46.4	0.59	3.82	0.02
	75^{th} Pctl.	776.8	55.2	0.75	5.42	0.04
	90^{th} Pctl.	2319.2	66.1	0.95	5.87	0.07

Table 2. Number of MMMFs across Families.

This table presents the distribution of money market funds across families. Data source is CRSP mutual funds database. Variables: All families – total number of families in the industry, Families w/MMMF – number of families with MMMFs. The rest of the variables describe the number of money market funds in a family.

Year	All Families	Families w/MMMF	Mean	Std Dev	25th Pctl.	Median	75th Pctl.
1992	430	204	4.31	7.75	1	2	5
1993	436	209	4.95	9.72	1	2	5
1994	452	207	5.48	10.61	1	3	6
1995	448	208	6.07	11.83	1	2	6.5
1996	469	206	6.36	12.79	1	3	6
1997	503	210	6.73	12.57	1	3	8
1998	504	205	6.76	12.05	1	3	8
1999	534	201	6.81	12.14	1	3	6
2000	597	224	6.52	10.83	1	4	7.5
2001	591	214	7.06	12.00	1	3.5	8
2002	566	196	7.86	13.39	1	4	8
2003	564	194	8.44	14.14	2	4	8
2004	578	186	9.36	14.81	2	4	10
1992-2004	750	323	6.64	12.02	1	3	7

Table 3. Univariate Analysis of the Mutual Fund Familys' Risk, Return, Expenses, and Total Net Assets.

The table reports descriptive statistics of mutual fund families with and without MMMFs during the 1992-2004 time period. Risk is measured as standard deviation of the monthly weighted average net returns of the family reported in the table as Return. Expenses are value weighted expense ratios for the family. Risk, Return, and Expenses are expressed in percentage. Total Net Assets (TNA) is measured in millions of dollars. N reports the number of family-year observations.

	N	Mean	Std Dev	Minimum	10th Pctl.	25th Pctl.	Median	75th Pctl.	90th Pctl.	Maximum
Panel A: Mutual Fund Families without MMMFs (μ1)										
Risk	2,472	4.17	2.92	0.11	1.34	2.31	3.53	5.27	7.37	27.30
Return	2,472	10.62	22.47	-79.11	-14.20	-1.51	9.70	21.06	33.56	286.53
Expenses	2,472	1.40	0.59	0.06	0.83	1.02	1.31	1.69	2.00	10.67
TNA	2,472	973.0	3312.1	10.0	17.4	41.3	147.3	520.9	2225.6	71860.2
Panel B: Mutual Fund Families with MMMFs, excluding MMMFs (μ2)										
Risk	2,909	3.05	2.19	0.08	1.09	1.61	2.57	3.89	5.45	28.80
Return	2,909	9.32	17.10	-51.85	-9.52	-1.27	9.73	17.73	25.62	255.24
Expenses	2,909	1.14	0.47	0.00	0.63	0.87	1.07	1.36	1.70	4.31
TNA	2,909	13012.0	49613.1	10.0	95.4	326.7	1471.5	6891.5	26634.3	748707.7
Panel C: Mutual Fund Families with MMMFs, including MMMFs (μ3)										
Risk	3,089	2.22	2.14	0.00	0.27	0.84	1.69	3.00	4.60	28.80
Return	3,089	7.83	14.62	-51.85	-5.51	1.30	6.68	13.33	21.41	255.24
Expenses	3,089	1.00	0.46	0.00	0.51	0.70	0.92	1.24	1.56	3.93
TNA	3,089	17223.5	59224.5	10.0	127.4	527.5	2230.4	9697.7	40064.8	902979.5
Panel D: Difference in means			Risk		Return		Expenses		TNA	
μ1- μ3			1.96	***	2.79	***	0.39	***	-16,251	***
μ1- μ2			1.12	***	1.30	**	0.26	***	-12,039	***

Table 4. Descriptive Statistics of Families with MMMFs.

The table reports descriptive statistics of the families with MMMFs during the 1992-2004 time period. Data source is CRSP mutual funds. Variables: TNAMMF/TNAFam is the ratio, as a percentage, of the total net assets of a family's money market funds to the total assets of the family, i.e. a liquidity measure of the family's money market funds securities holdings, RevenueMMF/RevenueFam is the percentage of fee revenues generated by the MMMFs relative to fee revenues of the other funds in the family, FrontLoad is the value weighted average front loads of the family, BackLoad is the value weighted average back loads of the family, ExpensesMMMF is the value weighted average expense ratios of the MMMFs in the family, and ExpensesFam is the value weighted average expense ratios of the other funds in the family, measured in percentage. CFvolMMMF and CFvolFam are volatility of flows to MMMFs and to other funds of the family respectively. CFcor is the correlation between cash flows to MMMFs and cash flows to the other funds in the family. N reports the number of year-family observations.

	N	Mean	Std Dev	Minimum	10^{th} Pctl	25^{th} Pctl	Median	75^{th} Pctl	90^{th} Pctl	Maximum
TNAMMF/TNAFam	2,157	34.86	29.88	0.01	2.56	7.52	25.82	59.93	79.63	99.45
RevenueMMF/RevenueFam	2,151	27.38	27.27	0.00	1.59	4.47	16.13	45.61	69.34	100.00
FrontLoad	2,152	1.60	1.91	0.00	0.00	0.00	0.46	3.48	4.50	8.03
BackLoad	2,152	0.42	0.80	0.00	0.00	0.00	0.00	0.50	1.44	5.00
ExpensesMMMF	2,144	0.64	0.25	0.00	0.32	0.45	0.61	0.79	0.97	2.00
ExpensesFam	2,152	1.08	0.41	0.00	0.61	0.84	1.03	1.29	1.60	4.29
CFvolMMMF	2,156	285.46	884.36	0.04	3.89	11.81	44.03	184.48	714.22	19639.51
CFvolFam	2,157	352.46	1186.58	0.07	4.39	14.19	61.15	221.66	636.17	18558.55
CFcor	2,156	-0.06	0.42	-1.00	-0.59	-0.33	-0.07	0.20	0.48	1.00

Table 5. MMMFs' Return Composition.

The table reports results from estimating pooled OLS and Fund and Year Fixed effects regressions of the factors determining returns of MMMFs at the fund level for the sample of 13,427 fund-years over the 1992-2004 period. The estimated coefficients are from regressions of the following equation:

$$r_{i,t} - r_{f_t} = \alpha + \beta_1 risk_{i,t} + \beta_2 Maturity_{i,t} + \beta_3 Expenses_{i,t} + \beta_4 \log TNA_{i,t} + \beta_5 Inf_t + \varepsilon_{i,t}$$

where the dependent variable is MMMF's gross return minus risk free rate. The independent variables include risk of MMMFs measured as standard deviation of monthly returns, maturity of MMMFs' portfolios measured in days, expense ratios expressed in percentage, the log of total net assets of MMMFs, and inflation. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-precent, 5-percent, and 1-percent levels, respectively.

	OLS		Fund and Year Fixed Effects		OLS		Fund and Year Fixed Effects	
Intercept	-0.023	***	-0.002		-0.017	***	-0.0004	
	(-42.63)		(-0.88)		(-38.33)		(-0.22)	
Risk	-1.905	***	2.420	***	-1.520	***	2.426	***
	(-7.02)		(12.31)		(-5.55)		(12.33)	
Maturity	0.00003	***	0.0000	*	0.00004	***	0.0000	*
	(5.50)		(-1.72)		(7.87)		(-1.68)	
Expenses	0.277	***	0.527	***	0.113	***	0.516	***
	(9.74)		(13.51)		(4.13)		(13.27)	
LogTNA	0.001	***	0.0002	***				
	(19.03)		(3.27)					
Inflation	0.408	***	0.174	***	0.404	***	0.174	***
	(33.25)		(13.59)		(32.50)		(13.52)	
Number of obs.	13,427		13,427		13,427		13,427	
R2	0.11		0.86		0.08		0.86	
Adj R2	0.11				0.08			

Table 6. MMMFs as a Cash Center of a Fund Family.

This table reports results from estimating pooled OLS and Family Fixed effects regressions of the family's cash flow volatility on MMMFs' cash flow volatility and maturity at the family level for the sample of 2,130 family-years over 1992-2004 period. The estimated coefficients are from regressions of the following equations:

$$CFVolMMMF_{i,t} = \alpha + \beta_1 CFVolFam_{i,t} + \beta_2 CFVolFam_{i,t} * CFCor_{i,t} + \beta_3 CFCor_{i,t} + \beta_4 Famturnover_{i,t} + \beta_5 \log TNAmmf_{i,t} + \beta_6 \log TNAfam_{i,t} + \varepsilon_{i,t}$$

$$Maturity_{i,t} = \alpha + \beta_1 CFVolFam_{i,t} + \beta_2 CFCor_{i,t} + \beta_3 Famturnover_{i,t} + \beta_4 \log TNAmmf_{i,t} + \beta_5 \log TNAfam_{i,t} + \beta_6 CFVolMMMF_{i,t} + \beta_7 FamilyHI_{i,t} + \beta_8 FamilyDiver_{i,t} + \beta_9 FamMMFCor_{i,t} + \beta_{10} RevMMF / RevFam_{i,t} + \varepsilon_{i,t}$$

where dependent variables are cash flow volatility and the value weighted average maturity of MMMFs in the family. The independent variables include volatility of family's flows (CFVolFam) and correlation of flows between MMMFs and other funds of the family (CFCor), and their interaction term. Other variables are family average turnover, the log of MMMFs' and the rest of the family's TNA, family Herfindahl index (FamilyHI), family diversification variable (FamilyDiver) derived from Fama-French five-factor model, correlation between risk of MMMFs and of the rest of the family (FamMMFCor), and the percentage of family's fee revenues from MMMFs (RevMMF/RevFam). T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-, 5-, and 1-percent levels, respectively.

	CFVolMMMF				Maturity			
	OLS		Family Fixed		OLS		Family Fixed	
Intercept	-1060.76	***	-1325.629	*	-38.67		-3.504	
	(-12.78)		(-1.83)		(-1.08)		(-0.08)	
CFVolFam	0.053	***	0.035	**	0.000		-0.0003	
	(3.50)		(2.38)		(-1.23)		(-1.22)	
CFVolFam*CFCor	0.096	***	0.098	***				
	(3.44)		(3.68)					
CFCor	86.704	**	39.554		1.091		1.481	**
	(2.00)		(0.90)		(1.29)		(2.05)	
FamTurnover	7.694		12.429		-0.463	*	-0.418	
	(0.66)		(0.68)		(-1.87)		(-1.22)	
LogTNAmmf	175.616	***	133.479	***	2.352	***	2.734	***
	(13.93)		(4.59)		(5.33)		(4.38)	
LogTNAfam	20.495		42.101		-1.735	***	-1.418	**
	(1.37)		(1.24)		(-3.89)		(-2.04)	
CFVolMMMF					0.001		0.001	
					(1.24)		(1.36)	
FamilyHI					-5.626	***	1.094	
					(-3.04)		(0.46)	
FamilyDiver					86.25	**	39.720	
					(2.38)		(0.94)	
FamMMFCor					-2.501	**	-2.310	***
					(-2.17)		(-2.54)	
RevMMF/RevFam					-1.474		-2.420	
					-0.66		(-0.79)	
Number of obs	2,130		2,130		2,100		2,100	
R2	0.23		0.47		0.06		0.53	
Adj R2	0.22				0.05			

Table 7. Determinants of MMMFs' Expenses.

This table reports results from estimating pooled OLS and Fund and Year Fixed effects of the factors determining expenses of money market funds at the fund level for 15,283 fund-years over the 1992-2004 period. The estimated coefficients are from regression of the following equation:

$$Expenses_{i,t} = \alpha + \beta_1 CFVolMMMF_{i,t} + \beta_2 AveExpensesFam_{i,t} + \beta_3 LogTNAMMMF_{i,t} + \beta_4 LogTNAfam_{i,t} + \varepsilon_{i,t}$$

Where *CFVolMMMF* is cash flow volatility of the MMMF and *AveExpensesFam* is value weighted expense ratio of the rest of the MMMF family. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-precent, 5-percent, and 1-percent levels, respectively.

	OLS		Fund and Year Fixed Effects	
Intercept	0.0057	***	0.0048	***
	(38.40)		(8.88)	
CFVolMMMF	-4.76E-07	***	0.000	
	(-5.57)		(-0.35)	
AveExpesesFam	0.2817	***	0.0410	***
	(36.90)		(5.31)	
LogTNAMMMF	-0.0005	***	-0.0001	***
	(-40.79)		(-7.32)	
LogTNAFam	7.29E-06		-0.0000	
	(0.58)		(-1.18)	
Number of obs	15,283		15,283	
R2	0.20		0.89	
Adj R2	0.20			

Table 8. Effect of Family Loads on the MMMFs' Characteristics.

The table reports results from Family Fixed effects OLS regressions of family average fund loads, excluding MMMFs, on the size of MMMFs in the family and cash flow volatility at the family level for the sample of 2,151 family-years over the 1992-2004 period. The estimated coefficients are from regressions of the following equations:

$$LIQ_{i,t} = \alpha + \beta_1 CFCor_{i,t} + \beta_2 AveFrontLoad_{i,t} + \beta_3 AveBackLoad_{i,t} + \beta_4 \log TNAfam_{i,t} + \varepsilon_{i,t}$$

$$CFVolMMMF_{i,t} = \alpha + \beta_1 CFCor_{i,t} + \beta_2 AveFrontLoad_{i,t} + \beta_3 AveBackLoad_{i,t} + \beta_4 \log TNAfam_{i,t} + \beta_5 LogTNAMMMF_{i,t} + \varepsilon_{i,t}$$

where dependent variables are liquidity ratio of the family measured as total net assets of MMMFs relative to total net assets of the family and cash flow volatility of MMMFs in the family. Independent variables include correlation of flows between MMMFs and other funds of the family (CFCor), value weighted average front, back, and total loads of the family and the log of total net assets of the family and of the MMMFs. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-precent, 5-percent, and 1-percent levels, respectively.

	LIQ				CFVolMMMF			
	Model 1		Model 2		Model 1		Model 2	
Intercept	0.7248	***	0.711	***	-1344.82	*	-1324.253	*
	(5.75)		(5.63)		(-1.85)		(-1.83)	
CFCor	0.008		0.007		103.327	**	103.848	***
	(1.06)		(1.01)		(2.53)		(2.55)	
AveFrontLoad	0.008	**			27.135			
	(2.21)				(1.24)			
AveBackLoad	-0.013	*			59.784			
	(-1.88)				(1.47)			
AveTotalLoad			0.004				33.493	*
			(1.19)				(1.66)	
LogTNAFam	-0.017		-0.019	***	31.189		35.127	
	(-4.20)		(-4.93)		(0.93)		(1.07)	
LogTNAMMMF					136.546	***	136.127	***
					(4.74)		(4.72)	
Number of obs	2,151		2,151		2,151		2,151	
R2	0.86		0.86		0.46		0.46	

Table 9. Effect of the Family's Risk on MMMFs' Risk and Maturity.

The table reports results from estimating pooled OLS and Family Fixed effects regressions of the family risk on MMMFs' risk and maturity at the family level for the sample of 2,130 family-years over the 1992-2004 period. The estimated coefficients are from regressions of the following equations:

$$risk_{i,t} = \alpha + \beta_1 familyrisk_{i,t} + \beta_2 Famturnover_{i,t} + \beta_3 \log TNAmmf_{i,t} + \beta_4 \log TNAfam_{i,t} + \beta_5 FamilyHI_{i,t} + \beta_6 FamilyDiver_{i,t} + \beta_7 FamMMFCor_{i,t} + \beta_8 \operatorname{Re} vMMF / \operatorname{Re} vFam_{i,t} + \beta_9 familyrisk_{i,t} * FamMMFCor_{i,t} + \varepsilon_{i,t}$$

where dependent variable is risk of MMMFs' portfolio of the family. The independent variables include family risk measured as standard deviation of monthly value weighted returns of the family's funds, family average turnover, the log of MMMFs', and the rest of the family's total net assets (TNA), family Herfindahl index (FamilyHI), family diversification variable (FamilyDiver) derived from Fama-French five-factor model, correlation between risk of MMMFs and the rest of the family (FamMMFCor), percentage of family's fee revenues from MMMFs (RevMMF/RevFam), and interaction term Family risk*FamMMFCor. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-precent, 5-percent, and 1-percent levels, respectively.

Panel A: Dependent variable: MMMF risk

	Model 1				Model 2			
	OLS		Family fixed		OLS		Family fixed	
Intercept	0.0003	***	0.0005		-0.003	***	-0.004	***
	(10.13)		(1.46)		(-3.67)		(-3.13)	
Family risk	0.0025	***	0.0040	***	0.004	***	0.006	***
	(7.62)		(8.72)		(4.52)		(5.47)	
FamTurnover	0.0000		0.0000		0.0000		0.0000	
	(-0.46)		(0.12)		(-0.34)		(0.38)	
LogTNAMMF	0.0000		0.0000		-0.00002	***	0.0000	
	(-0.36)		(0.40)		(-2.48)		(-0.57)	
LogTNAFam	0.0000		-0.00003	**	0.00001		0.00004	**
	(-0.42)		(-2.61)		(1.28)		(-2.08)	
FamilyHI					0.0000		-0.0001	
					(-0.19)		(-1.31)	
FamilyDiver					0.0035	***	0.005	***
					(3.94)		(3.60)	
FamMMFCor					0.00004	*	0.00005	**
					(1.84)		(1.95)	
RevMMF/RevFam					0.0002	**	0.0001	
					(2.48)		(1.18)	
Family risk* FamMMFCor					-0.003		-0.005	
					(-0.28)		(-0.41)	
Number of obs	2,130		2,130		2,100		2,100	
R2	0.03		0.13		0.04		0.14	
Adj R2	0.03				0.04			

Table 9 Continued

$$Maturity_{i,t} = \alpha + \beta_1 familyrisk_{i,t} + \beta_2 Famturnover_{i,t} + \beta_3 \log TNAmmf_{i,t} + \beta_4 \log TNAfam_{i,t} + \beta_5 FamilyHI_{i,t} + \beta_6 FamilyDiver_{i,t} + \beta_7 FamMMFCor_{i,t} + \beta_8 \mathrm{Re}vMMF / \mathrm{Re}vFam_{i,t} + \beta_9 familyrisk_{i,t} * FamMMFCor_{i,t} + \varepsilon_{i,t}$$

where dependent variable is value weighted average maturity of money market funds in the family. The independent variables include family risk measured as standard deviation of monthly value weighted returns of the family's funds, family average turnover, the log of MMMFs' and the rest of the family's total net assets (TNA), family Herfindahl index (FamilyHI), family diversification variable (FamilyDiver) derived from Fama-French five-factor model, correlation between risk of MMMFs and the rest of the family (FamMMFCor), percentage of the family's fee revenues from MMMFs (RevMMF/RevFam), and interaction term Family risk*FamMMFCor. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-precent, 5-percent, and 1-percent levels, respectively.

Panel B: Dependent variable: Maturity

	Model 1				Model 2			
	OLS		Family fixed		OLS		Family fixed	
Intercept	38.9843	***	31.3511	**	-16.307		51.285	
	(24.90)		(2.48)		(-0.35)		(0.93)	
Family risk	-31.2290	*	-13.8307		100.27	**	35.832	
	(-1.72)		(-0.74)		(2.02)		(0.76)	
FamTurnover	-0.5273	**	-0.4353		-0.424	*	-0.414	
	(-2.19)		(-1.35)		(-1.71)		(-1.21)	
LogTNAMMF	1.8208	***	1.9848	***	2.608	***	2.632	***
	(9.37)		(4.92)		(5.90)		(4.37)	
LogTNAFam	-0.6503	***	-0.4364		-2.038	***	-1.102	
	(-3.17)		(-1.05)		(-4.50)		(-1.57)	
FamilyHI					-6.375	***	0.826	
					(-3.41)		(0.34)	
FamilyDiver					63.41		-17.698	
					(1.33)		(-0.33)	
FamMMFCor					-2.508	**	-2.511	***
					(-2.13)		(-2.64)	
RevMMF/RevFam					-7.104	**	-4.955	
					(-2.19)		(-1.18)	
Family risk* FamMMFCor					-1227.5	**	-700.2	
					(-2.29)		(-1.46)	
Number of obs	2,128		2,128		2,100		2,100	
R2	0.05		0.53		0.06		0.53	
Adj R2	0.04				0.06			

Table 10. Effect of the Family Fund Investment Objectives on the Number and Investment Objectives of MMMFs.

The table reports results from estimating Family Fixed Effect OLS, and Family Fixed Effect Poisson regressions of family investment objectives on the number of MMMFs in the family and their investment objectives for the sample of 2,152 family-years over the 1992-2004 period. The estimated coefficients are from regressions of the following equations:

$$Dependent_{i,t} = \alpha + \beta_1 FamObjNum_{i,t} + \beta_2 FamFundNum_{i,t} + \beta_3 AveFrontLoad_{i,t} + \beta_3 AveBackLoad_{i,t} + \beta_4 \log TNAMMMF_{i,t} + \beta_5 \log TNAfam_{i,t} + \varepsilon_{i,t}$$

where dependent variables are number of MMMFs offered by the family – MMMFNum, number of investment objectives of MMMFs offered by the family - MMMFObjNum, and Herfindahl index of MMMFs in the family – MMMFHI. The independent variables include number of family investment objectives besides MMMFs (FamObjNum), number of funds in the family, excluding MMMFs, (FamFundNum), value weighted average of front and back loads in the family, and the log of total net assets of MMMFs and the family. T-statistics for OLS and z-statistics for Poisson are reported in parentheses. Poisson regression reports Pseudo R^2. The symbols *, ** and *** indicate statistical significance at less than the 10-precent, 5-percent, and 1-percent levels, respectively.

	MMMFNum				MMMFObjNum				MMMFHI	
	OLS		Poisson		OLS		Poisson		OLS	
Intercept	-7.695	*			0.437				0.473	***
	(-1.91)				(1.18)				3.95	
FamObjNum	-0.192	***	0.011	*	0.013	***	0.008		-0.040	***
	(-3.33)		(1.86)		(2.54)		(0.77)		-23.23	
FamFundNum	0.101	***	0.003	***	0.001	***	0.000		0.000	**
	(19.61)		(8.22)		(2.47)		(0.11)		2.13	
AveFrontLoad	0.213	*	0.007		0.056	***	0.025		0.007	*
	(1.78)		(0.51)		(5.11)		(1.14)		1.78	
AveBackLoad	-0.345		-0.051	*	-0.014		-0.014		0.009	
	(-1.55)		(-1.87)		(-0.70)		(-0.33)		1.30	
$LogTNA_{MMMF}$	1.715	***	0.340	***	0.280	***	0.160	***	-0.003	
	(10.83)		(13.48)		(19.32)		(4.73)		-0.56	
LogTNAFam	-0.266		0.003		-0.091	***	-0.064		-0.001	
	(-1.30)		(0.10)		(-4.86)		(-1.47)		-0.14	
Number of obs	2,151		2,126		2,151		2,126		2129	
R2	0.90				0.88				0.80	