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Cross-Sectional Differences between Topic 1: Money Market Mutual Funds and their Role in the Mutual Fund Families. Topic 2: Innovations in Financial Products. Conventional Mutual Funds versus Exchange Traded Funds.

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TWO ESSAYS ON MUTUAL FUNDS

BY

ANNA AGAPOVA

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree
of
Doctor of Philosophy
in the Robinson College of Business
of
Georgia State University

GEORGIA STATE UNIVERSITY
ROBINSON COLLEGE OF BUSINESS
2007

ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor in Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

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ABSTRACT

TWO ESSAYS ON MUTUAL FUNDS

BY

ANNA AGAPOVA

April 16, 2007

Committee Chair: Dr. Jason T. Greene

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The first essay examines cross-sectional differences between 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 study's analysis find that fund family characteristics also affect the management of MMMF assets, contributing to differences in the maturity of the fund's holdings, expenses, and realized returns. I find that an MMMF is not simply a transitional account with a short-term low-risk investment objective, but rather, a critical role player within the fund family. Differences in maturity, yield, and expenses in MMMFs can be explained by family-specific characteristics, including diversification and cash management strategies at the family level.

The second essay examines implications of substitutability of two similar financial assets: conventional index mutual funds and exchange traded funds (ETFs). I seek to explain the coexistence of these fund types, since both offer a claim on the same underlying index return process, but have different organizational structures. This study compares conventional open-end index funds with matched ETFs on various underlying indexes. Aggregate flows are used to detect substitution and clientele effects. I show that conventional funds and ETFs are substitutes, while ETFs have smaller tracking errors and lower fund expenses. However, I find that these fund types are not perfect substitutes, and their coexistence can be explained by a clientele effect that segregates them into different market niches.

ESSAY ONE

CROSS-SECTIONAL DIFFERENCES BETWEEN MONEY MARKET MUTUAL FUNDS AND THEIR ROLE IN MUTUAL FUND FAMILIES

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 include more than $2 trillion in assets across 993 funds, and comprise approximately 25% of U.S. open-end mutual fund assets by 2005, according to the Investment Company Institute (ICI).

Though MMMFs are second only to equity funds in terms of dollar value of assets in the mutual fund industry, the majority of 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 are currently only a few studies that address the cross-sectional differences among money market funds, and no studies relating MMMF fund family characteristics.

However, numerous researches focus on the skill of equity fund managers.[1] Although there is extensive literature on the 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 with regard to mutual funds that invest in fixed income securities, specifically, MMMFs. As exemplified in Table 1, there are substantial differences in weighted average maturity,

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

yields and expenses across MMMFs; however, relatively little research has been done to explain these cross-sectional differences. This study extends the coverage of issues related to MMMFs.

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

To study the performance-flow relation of MMMFs and how it affects decisions to waive fees, Christoffersen (2001) 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.

In this study, I 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 transfers 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 to meet that need. In this study, I search for evidence of such investor and fund family behavior and examine its extent, based on fund family characteristics.

I also study the degree to which a family's risk may be internally managed using MMMFs, by adjusting the maturities and risk of the funds' underlying securities, and thereby adjusting the risk of MMMFs. I 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. This 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 between 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 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.

Results demonstrate that MMMF returns are influenced by risk and maturity of the MMMFs' portfolios, fund expenses, size, and macroeconomic factors. I 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 of investment objectives for 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 this paper is organized as follows: Section 2 develops the hypotheses and methodology for examining MMMFs. I provide data description and empirical analyses in Section 3, while Section 4 concludes the paper and offers research implications.

2. Cross-sectional examination of money market mutual funds

MMMFs offer investors a relatively homogeneous product – short-term debt securities with relatively low risk. Choice of securities that can be used in money market portfolios is limited by regulations. Rule 2a-7 under the Investment Company Act of 1940 specifies that money market funds may 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 must limit investments to securities with minimal credit risk, and invest no more than five percent of the fund's total net assets in second tier securities, or those of a single issuer. As the products are very similar, we would expect homogeneous characteristics among MMMFs, i.e. weighted average maturity, yields and expense ratios should not vary much. Therefore, one would not expect widely different strategies and unique asset compositions across various 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 that suggested by previous studies. However, they still find that managers have the ability to predict changes in short-term interest rates.

While earlier studies examine time series variations of MMMFs' maturities, I focus on cross-sectional variations between MMMF characteristics. Consistent with earlier studies' conclusions that find that MMMFs are actively managed, I conclude that MMMFs do vary significantly in important characteristics, including maturity, return, and expenses. This implies that, possibly, these funds are not passive portfolios and may serve purposes beyond those of simply transitional accounts. Detailed analysis of the data is provided in Section 3.

2.1. Factors influencing MMMF 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 expense ratio is the most important factor in explaining difference between net returns, and that the MMMFs' relative returns show strong persistence. I examine additional factors and find that it is not only expenses that determine cross-sectional variation of MMMF returns.

The primary argument for observed differences in MMMF yields is that these funds pursue different risk levels, 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 their 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, changing quality and/or maturity of securities can alter returns. Adjustment of maturity premium has been addressed in previous studies; however, these studies except DeGennaro and Domian (1996) did not examine it as a choice of asset composition, but rather 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, which include: (i) the level factor, which represents movements in yields; (ii) steepness, which represents changes in steepness of yield curve, i.e. relation to maturity; (iii) the Treasury factor, which captures

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

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.

Although common reasons for holding money market funds are liquidity and transaction services combined, MMMF investors may have additional reasons for utilizing these accounts. For those concerned about the safety of their investment, it is appropriate to place their money in accounts that include a portfolio of government securities, accepting lower return on the investment.[3] For less risk-averse investors, higher returns in MMMFs with higher risk securities are 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 unique demands. This variety comes from diverse clientele, and is reflected in variety of portfolio asset compositions.

I test MMMFs for the factors determining their returns and predict that MMMFs with higher risk and higher weighted average maturity have higher returns. Based on Knez et al.'s (1994) return factors of money market securities, this prediction estimates the second and third parts of risk composition in return – risk (default) and maturity premiums. I employ the following model, which includes cross-sectional fund and economy related factors:

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

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 the 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

[3] For extremely risk-averse investors, the choice will not include mutual funds, as banks offer money market accounts with FDIC insurance of up to $100,000.

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*. Finally, $\varepsilon_{i,t}$ is the error term.

I expect β_1 and β_2 to be positive, as the return should increase with risk and maturity premiums. The remaining variables are controls and included for the following reasons. Expense ratio is a proxy for better management, and, as better services cost more, I expect the coefficient of this variable to be positive. MMMFs with higher expense ratios should have better performance in the form of higher returns 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' maturity dates and would be expected to choose longer maturities, translating 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 effect 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.

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

2.2. Family factors

The 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 diverse risks, and may have unique needs in terms of cash when they face redemptions or purchases. Those risks and cash flows may interact among individual funds within the complex.

Fund families can provide additional benefits to investors in the form of potential for economies of scale and scope and also in terms of asset management, as they have larger pools of managerial sources, distribution externalities and better research qualities. A fund family also has its own objective 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 a variety of structures of the 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, elevating the cash management function from the fund to the family level. It is possible to have no liquidity flows into or out of the family, and, therefore, no transaction costs. Anecdotal evidence of such strategy use is an example from Vanguard Funds family. In July of 2004, Vanguard launched an MMMF “available only to

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

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 follows. To illustrate, 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 the cash to adjust the fund portfolio holdings to the target, he will put the cash in money market securities. An 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 markets 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 transaction, the MMMF's role is to fulfill cash needs, not only of individual investors, but also that of other funds in the family. However, this pattern of fund flows is feasible if cash flows of the MMMF and the other funds of the family are highly negatively correlated or if 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 requirements; and therefore, if MMMFs play the role of family cash centers, the shorter the weighted average maturity of a MMMF.[8]

[6] Vanguard Market Liquidity Fund, Semiannual Report 2005.
[7] However, 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 that cash flow volatility and finds that cash holdings increase with volatility.

Depending on the level of cash flow correlation among funds in a family, MMMFs can also play a different role. In the first scenario, all flows happen within a family, and no cash leaves the complex; thus, a closed system. For example, an equity fund had transferred some amount to a bond fund, the bond fund had transferred to some other equity fund, and the latter transferred to an MMMF. In this case, when all cash flows can be offset, to avoid any transaction fees, the complex should not sell and buy securities outside the family and all cash transfers should happen through an 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, an MMMF of the same fund family experiences outflow. If the MMMF acts as a cash center, 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 that 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 required. 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 in the case that all transactions are 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. When possible, using

[9] For simplicity, I ignore other funds in a complex; this does not change the logic and outcome of the strategy.

MMMFs as a cash center for 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 terms of cash management. As a result, if families use MMMFs as cash centers, I predict that a family with funds of higher cash flow volatility will have 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:

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

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

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]

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[10] Cash flows to the MMMFs and to the family are calculated using Sirri and Tufano's (1998) methodology. I 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 the 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, I use Sirri and Tufano's (1998) methodology because I need to have consistent measures of fund flows for all types of fund investment objectives.

I 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 in the families, use MMMFs as cash centers. 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 the MMMFs. As volatility of the family's cash flows increases, managers would shorten the maturity of MMMFs' securities to release more cash for liquidity purposes and 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 $CFVolFam{*}\ CFCor_{i,t}$ are control variables that allow monitoring as to 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 and managers' point of view, i.e. how managers can optimize transactions in the family. On the other hand, MMMFs can play a role for an investor within the family. It is quite possible that existence of an MMMF within 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 whenever 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 as a result of moving his money in or out of the fund. However, these fees are omitted if investors' assets are moved within a family. Massa (2003) shows that mutual fund families employ strategies that rely on the heterogeneity of 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 can be more attractive than outside money market accounts to an investor. Chordia (1996) develops a model and finds empirical evidence at the individual fund level, showing that redemption rates are higher in funds without load fees than in funds with fees and, therefore, cash holdings decrease with load fees. I 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 larger families. I argue that families with higher average loads will experience more use of MMMFs by investors, who realize the option of a free move.

I predict that a family with higher load funds includes a relatively larger MMMF(s), and a family with higher load funds has higher volatility of MMMF(s) cash flows. If investors move their assets among funds within a family, instead of through money market accounts outside the family, then volatility of the family's MMMFs cash flows is higher than for those of a family that does not restrain investors from leaving the family by charging loads.

Predictions are tested with the following models, which are similar to Chordia's (1996) model of cash management tests at the fund level. The 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 $LIQ_{i,t}$ is a 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.

I 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, then the family will have less need for cash management of investors' flows through MMMFs, as loads will fulfill that role at the fund level. Thus, loads would decrease the family liquidity ratio in a manner similar to that reported by Chordia (1996) at the fund level. It remains an empirical question as to whether investors are sensitive to loads and take advantage of free asset transfer options within the family. The other variables are controls: the sizes of MMMFs and families, as well as cash flow correlation may impact investors' decisions 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 existing literature that examines risk-taking strategies of mutual funds and risk strategies within fund families. The latter studies are of more interest to this paper, and the main question that they explore is as to whether fund families

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[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. My measure of family liquidity ratio is conceptually the same.

maximize their own objective functions 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 interests of an investor. Chevalier and Ellison (1997), among others, show that a non-linear convex shape of flow-performance relation (Sirri and Tufano (1998)) creates incentive for a fund manager to increase or decrease fund risk, 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, in order to maximize the fund objective function, the fund manager has an incentive to take actions that increase fund inflows from investors by changing risk, or using other actions that might conflict with investors' interests.

A conflict of interests may exist as family affiliations may influence the incentives of fund managers away from its shareholders interests, if the whole family is going to benefit from a particular strategy. Gaspar, Massa and Matos (2006), and Guedj and Papastaikoudi (2003) argue that families support better performing and/or higher fee funds in order to maximize proceeds to the family and, therefore, to maximize the family's objective function. This family strategy of "favoritism" can be in the form of "cross-fund subsidization", by shifting performance across funds (Gaspar et al. (2006)) as well as through limited resources allocation across funds (Guedj and Papastaikoudi (2003)). However, family objective 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 family funds, with little or no performance disturbance.

Massa (1998) develops a model of mutual fund industry structure that explains the 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 hedge risk using 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 that there is no need for a fund family to do so for him. However, 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/her own. The second is that a family may want to diversify in order to reduce its risk in a process of maximizing its own objective function. Thus, to attract more investors' assets, families manage risk to capture a larger share of investors with various risk preferences, which is reflected in clientele effect as well, as discussed in the following section.

If a fund family comprises high-risk securities, then, to offset the risk, the family's MMMFs would be expected to hold less risky and/or shorter maturity securities, and vise versa. I 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 an MMMF's return factors, and from risk diversification of a family portfolio. 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 *i* family's returns, measured by finding monthly weighted average returns of the family portfolio, excluding MMMFs, and then calculating the standard deviation of those 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. I 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, I 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, in order to free some cash and reduce transaction costs. $logTNAmmf_{i,t}$ and $logTANfam_{i,t}$ are controls.

Families have different degrees of concentration in a specific objective type, different number of fund objectives, and a unique risk correlation among funds in a family. For instance, a bond fund will have higher risk correlation with an 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 comprises mostly equity funds, then different objectives within equity funds may offset risks of each other. Therefore, the role of an MMMF for family risk control purposes is more important in a single fund type family, or in a more concentrated family, than for a family with less risk correlation.

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

To account for the level of in-family correlation, diversification, and the risk correlation of the other funds with MMMFs' risk, I propose the following with regard to the family risk management strategy. A family with higher concentration in a single objective category has an MMMF(s) with lower risk and shorter maturity. A family with higher positive correlation in risk between funds has an MMMF(s) with lower risk and shorter maturity. The following models are used to test the predictions.

$$\begin{aligned} Risk_{i,t} &= \alpha + \beta_1 Familyrisk_{i,t} + \beta_2 Famturnover_{i,t} + \beta_3 \log TNAmmf_{i,t} + \\ &\beta_4 \log TNAfam_{i,t} + \beta_5 FamilyHI_{i,t} + \beta_6 FamilyDiver_{i,t} + \beta_7 FamMMFCor_{i,t} + \\ &\beta_8 \operatorname{Re} vMMF / \operatorname{Re} vFam_{i,t} + \beta_9 Familyrisk * FamMMFCor_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{8}$$

$$\begin{aligned} Maturity_{i,t} &= \alpha + \beta_1 Familyrisk_{i,t} + \beta_2 Famturnover_{i,t} + \beta_3 \log TNAmmf_{i,t} + \\ &\beta_4 \log TNAfam_{i,t} + \beta_5 FamilyHI_{i,t} + \beta_6 FamilyDiver_{i,t} + \beta_7 FamMMFCor_{i,t} + \\ &\beta_8 \operatorname{Re} vMMF / \operatorname{Re} vFam_{i,t} + \beta_9 Familyrisk * FamMMFCor_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{9}$$

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, which measures concentration of the family i in a specific objective besides that of its 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.

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

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, I 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. Thus, the lower the value of $FamilyHI_i$, the less concentrated the family.

Another proxy for family diversification is $FamilyDiver_{i,t}$, which is defined here as one minus a standard deviation of the residual (σ_ε) from the Fama-French five-factor model, which captures idiosyncratic risk that is not diversified away by a family portfolio. Thus, the larger 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 as follows:[14]

$$R_t - RF_t = \alpha + \beta_1[RM_t - RF_t] + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 TERM_t + \beta_5 DEF_t + \varepsilon_t \tag{11}$$

[14] 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.

$FamilyMMFCor_{i,t}$ 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*.

I also include as a control variable percentage of fee revenues generated by MMMFs relative to fee revenues of its whole family. These 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.

I expect a negative relation between family concentration ($FamilyHI_{i,t}$) and risk level and maturity of MMMFs' portfolios within the family. A positive sign is expected on the family diversification ($FamilyDiver_{i,t}$) variable, i.e. more diversified families will require less risk management through MMMFs. $FamilyMMFCor_{i,t}$ controls for whether there is room for risk management, and is expected to be negative, as lower correlation will allow more possibilities for using diversification strategies.

2.2.4. Clientele

For transitional accounts and cash management, a family requires only one MMMF. However, in reality, families have more than one (See Table 3).[15] The reason can be attributed to the clientele effect among investors. Families have different MMMF categories and investment objectives, such as taxable and tax-exempt, retail and institutional.[16] Massa (2003) finds evidence of family-driven heterogeneity among funds

[15] For example, the Federated Securities Corporation family has 105 MMMFs, including share classes.

[16] Some examples of MMMF objectives, according to ICDI fund objective codes include: MF – Money Market Tax Free Funds, which invest in municipal obligations that are close to maturity; MQ – High Quality Municipal Bond Funds, which invest in municipal securities rated BBB or better; among others.

and shows that families actively exploit it. He argues that when it is very costly to compete on the performance dimension alone, the family will focus on other ways of attracting investors, such as by reducing fees or increasing the number of funds within the family.

As investors prefer different risks and pursue different strategies in their portfolios, they may require 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 styles. I predict that the higher the number of fund styles within a family, the greater the number of MMMFs with different characteristics and investment objectives that are offered by that family.

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

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

where proxies for dependent variable are: 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 previously defined. For the dependent variables $MMMFNum_{i,t}$ and $MMMFObjNum_{i,t}$, β_1 and β_2 are expected to be positive as increased number of fund objectives and more funds within the family will indicate greater investor heterogeneity, therefore, higher numbers of 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 predictions for loads effect in "cash centers", indicating investors' use of other funds in the family. The remaining variables are controls and are as previously defined. Two of the dependent variables are count data, and, to overcome restriction of OLS assumption of continuous normal distribution of a dependent variable, I use the 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 between MMMFs, it is possible that a family has other specific effects that determine differences. For example, the family can have generally higher expenses for all funds, and, therefore, MMMFs from that family would have higher levels of expenses as well, compared to MMMFs from other families. These higher expenses should be compensated for by higher returns, as funds that show enhanced performance that is achieved through better management, require higher fees for that expertise.

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

A test of the first part of this prediction is combined with the return composition test, as defined above. The second part is tested at the fund level, as follows:

$$Expenses_{i,t} = \alpha + \beta_1 CFVolMMMF_{i,t} + \beta_2 AveExpensesFam_{i,t} + \beta_3 LogTNAMMMF_{i,t} + \beta_4 LogTNAfam_{i,t} + \varepsilon_{i,t} \quad (13)$$

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. B_2 is expected to be positive, reflecting overall family strategies in fee settings. The other variables are controls.

3. Data description and empirical results

The primary data source for this study is the Center for Research in Security Prices (CRSP) survivor-bias free US mutual fund database. I 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.[17] I drop the fund observations with TNA 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 the entire period of the study, are presented in Table 1. The data show that there is substantial cross-sectional variation among the MMMFs in the variables presented in the table. For example, the standard deviation of the weighted average maturity is 17 days with a mean (median) of 45 (46) days. A similar picture is observed for 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)%.

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

Table 2 exhibits statistics based on 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. Although it may appear that families with MMMFs represent less than 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 had more than 90 percent of the mutual fund industry asset share as of December 2004. It is noticeable as well 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, during the same time period. The number of families that offer MMMFs varies over the years, with a peak occurring in 2000, which can be explained by waves in the economy and popularity of different investment products.[18]

Most of the tests used in this study are for fund-family relations. First, using the list of MMMFs that I obtained, I 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 funds other than money market, I drop the MMMF-only families from the sample.

Other sources of the data are as follows. Fama-French three factors are 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 the consumer price index (CPI) as reported by US Department of Labor.

[18] The total number of families was the largest in 2000 as well.

The first set of results is from fund level tests, excluding family effects. Some of the differences in the MMMFs' characteristics can be explained by differing risk-return strategies that various MMMFs pursue. Table 5 reports the factors that affect returns for MMMFs. Coefficient on the $Risk_{i,t}$ variable is positive, as expected, and statistically significant at less than 1-percent level, however, maturity has almost zero effect. Coefficient on the $LogTNA_{i,t}$ variable has a 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 an MMMF can be a close proxy for maturity, as the coefficient of $Maturity_{i,t}$ does not change much. Inflation has a positive sign as expected. Expenses are positively related to gross returns, which are 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 prediction results are reported in Table 6. As expected, cash flow volatility of the family and MMMFs are positively related at less than 5-percent level. Cash flows correlation and the interaction term of the family cash flow volatility and cash flow correlation, used as control variables for indicating an 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 cash centers by clearing appropriate cash and securities transactions within a family through MMMFs.

If money market securities' maturities were used as a means to conduct a cash management strategy, then a negative relation between an MMMFs' maturity and family cash flow volatility would be expected. Results for $CFVolFam_{i,t}$ variable in this model are not significant. Thus, although families use MMMFs as cash centers, the families do not use active cash management strategies by controlling maturity of MMMFs' portfolios.

Family cash management activities performed through MMMFs may have some effect on expenses in MMMFs, as additional costs associated with these activities may exist. I test whether cash flow volatility of MMMFs affects their expense ratios. Results reported in Table 7 demonstrate that expenses do not increase with MMMFs' cash flow volatility. Thus, the benefits of these strategies may outweigh additional costs.[19]

The level of MMMF assets across families is reported in Table 4. The percentage of the TNA of MMMFs in the TNA of the family, identified here as a measure of the family's liquidity, varies substantially across families. Specifically, the mean is 34.86%, with a 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 family liquidity ratio and cash flow volatility of MMMFs are reported in Table 8. With control for family fixed effects, results indicate that front loads are positively related to family liquidity ratio, as expected. As investors pay front load fees only once at the entry to the family, they choose to move their assets within the family. Therefore, there is enhanced need for money market securities as transitional accounts within the family, and MMMFs serve that purpose for investors. Back loads have different effects. Back loads are negatively related to family liquidity ratios. It is possible that funds that impose back loads attract investors with long-term

[19] However, even if there is a cost of running the cash management strategy at the family level, it cannot be passed on to individual investors in MMMFs. As all family investors enjoy the benefits, the costs can be reflected in the expense ratios of all funds within the family.

investment horizons. Chordia (1996) suggests that there is separation between investors who 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 in order 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 might use family cash centers for trading purposes.

The effect of loads on MMMFs' cash flow volatility is as follows. When loads are separated into front and back, then results are not conclusive, as they lack statistical significance. However, total family loads are positively related to MMMF cash flow volatility, which is consistent with my predictions. As higher loads make it more attractive for investors to move their assets within the family through the cash center, so the cash flow volatility of MMMFs increases.

Tests of the risk management predictions reveal the following picture. Results of univariate analysis of families, with and without MMMFs, as presented in Table 3, indicate that families that do not have MMMFs have higher risk than those families that do. Specifically, the mean value of risk for the former is 4.2% with a standard deviation of 2.9%, versus mean value of risk for the latter, which excludes MMMFs, is 3.1% with a standard deviation of 2.2%. Even more, after MMMFs are included into the calculation, mean value of a family risk becomes 2.2%, with a 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, using money market funds to control their risk. Differences in means are statistically significant, at less than 1-percent.

Results of regression analyses of the risk management strategies are reported in Table 9. Panel A includes results for the first proxy of a dependent variable – standard deviation of MMMF returns, which measures overall risk of the money market portfolios. In Eq. (6), risk of MMMFs is positively related to the family risk with statistical significance at less than 1-percent level, which is opposite of what was expected, if families were to use MMMFs for risk management strategies. One explanation of this result is that families with higher levels of risk choose higher risk investments 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 family risk is negative, as expected, with significance at 10-percent level for OLS regression.[20] 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 the following explanation. Family turnover is negatively related to maturity, indicating that as turnover increases, families control increased trading activity with shortening maturity of their MMMFs. Size of MMMFs is positively related to maturity, indicating that larger money market funds can afford to have longer maturity for their portfolios as they may have more liquidity, due to differing expirations of their holdings.

The results of Eq. (8) and (9) tests for family concentration and the level of family diversification are reported in both panels under Model 2. I expect that risk management strategies are more often required for more concentrated and less diversified families, and are more feasible with MMMFs whose risk is less correlated with the risk of the rest of

[20] With control for family fixed effects, the power of some of the variables in the test diminishes.

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 Eq. (6), as reported in Model 1. I find that MMMF risk is positively related to family diversification, as expected, and 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 family risk is positive, which is consistent with the finding that MMMF 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.[21] Concentration of a family is negatively related to $Maturity_{i,t}$, i.e. more concentrated families choose shorter MMMF maturity to control for family risk. The correlation between MMMF and family risks is negatively related to MMMF maturity, as expected, indicating that for the lower correlation families, use of MMMFs for family risk management strategies is more feasible.

Risk and cash management strategies may affect the level of family returns. I 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 returns, so I can conclude only about joint effect. Table 3 shows that families without MMMFs, on average, have higher returns than MMMF families, though this may be due to the fact that the former have higher risk in their portfolios, and so are compensated for that risk. Indeed, the average level of risk for families without

[21] However, statistical power is lost for many variables when using the control for family fixed effects.

MMMFs is 4.17%, versus the average level of risk of 3.05 (2.22)% for families with MMMFs, excluding (including) MMMFs. Risk and cash management strategies may generate higher risk adjusted returns. I can make some conclusions about the effect of cash management strategy by examining the levels of expense ratios. 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 reduced transaction costs.

Results of the clientele tests are reported in Table 10. To check for the robustness of the results, I perform both OLS and Poisson analyses with family fixed effects, the latter of which 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 various 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 that family. With the use of the number of MMMF objectives as a dependent variable, the number of family objectives is also positively related. Though, the total number of funds offered by the family has mixed results, I can infer that, as there is more investor heterogeneity in fund families, those families offer more MMMFs of different styles to meet a broad range of investors' needs. Use of MMMFs' Herfindahl index as a dependent variable shows results consistent with the above findings. Thus, the clientele effect is found to be present.

This paper's final set of analyses tests whether family characteristics determine cross sectional differences between MMMFs in terms of both expenses and other variables. Table 7 shows that the family level of expense ratios determines those of the

MMMFs within the family. The coefficient on the value weighted average expense ratio of the family is positive and highly significant, which is consistent with my prediction. Also, as reported in Table 5, expense ratios of MMMFs are positively related to gross returns of the funds, which is consistent with the prediction that higher fees result from compensation for better management.

4. Conclusion

In this paper, I examine cross-sectional differences between money market mutual funds during the period 1992-2004. I find evidence that fund families and their investors often use MMMFs as cash centers, since family cash flow volatility is positively related to MMMF cash flow volatility. In addition, I discover that loads affect a fund family's liquidity ratio, level of MMMF assets, and cash flow volatility of MMMFs. Using an option of free asset transfer within a family, investors assign MMMFs the function of a cash center within the family, as well. The results of this study demonstrate that both front and back loads play different roles in discouraging investors from moving assets in or out, at the fund level, and, therefore, offer unique 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 found in Chordia (1996), in which back-end loads are found to attract only investors who do not intend to move their assets, even within a family. In contrast, front-end loads have the opposite effect, confirming my prediction that front loads have a positive relation with a family's liquidity ratio. Total loads are also positively related to an MMMF's cash flow volatility. Thus, the cash management function is shifted to the family level.

As a result of analysis, I find that MMMF returns are determined by risk factors, such as risk of MMMFs' portfolios, expenses and size of funds, as well as macroeconomic factors. This provides a glimpse into the root causes of influences in the observed cross-sectional differences between MMMFs' returns at the fund level. In addition, the 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, I find that MMMF risk decreases as families are less diversified and more concentrated.

In addition, I look for a clientele effect, in the effort to explain variety among 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. I can conclude that families with more investor heterogeneity offer more MMMFs, of different types, to meet investors' needs. This is an indication of the presence of a clientele effect.

Family characteristics also determine cross-sectional differences between MMMFs with regard to expenses. I find that MMMF 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 may translate into significant investor benefits.

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Table 1.1. 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 1.2. 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 1.3. 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	10^{th} Pctl.	25^{th} Pctl.	Median	75^{th} Pctl.	90^{th} 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 1.4. 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 1.5. 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 1.6. 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:

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

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

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 1.7. 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 1.8. 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 1.9. 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:

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

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 1.10. 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	

ESSAY TWO

INNOVATIONS IN FINANCIAL PRODUCTS: CONVENTIONAL MUTUAL FUNDS VERSUS EXCHANGE TRADED FUNDS

1. Introduction

Innovations in financial markets are important for market development. A relatively recent example of innovation comes from the mutual fund industry, with the introduction of exchange traded funds (ETF). These ETFs offer a claim on the same underlying assets as those of conventional open-end mutual index funds, but have an organizational form different from that of conventional mutual funds and, accordingly, have different features and outcomes for investors. Some other examples of competing innovations are money market accounts offered by both mutual funds and banks, and futures contracts with the same underlying assets and/or trading on different exchanges. All of these innovations were created to capture some part of the competitive market, and though they are costly to develop, they are beneficial to investors, as they add to the completeness of the market through increased liquidity, ease of trade, possibilities for hedging and arbitrage, and additional services.

Not all innovations have been successful. For example, some studies show that the introduction of redundant contracts in futures markets have failed to attract enough market share to survive (Duffie and Jackson (1989), Johnston and McConnell (1989), Silber (1981)). Successful innovations also should be studied to provide grounds for other innovations. Not many empirical studies exist on financial innovations, as was pointed out by Frame and White (2002), and those that exist are clustered around very few products. The main reason for this, as the authors suggest, is unavailability of data. This paper uses a broad sample of indexes to study the ETF as an innovation in organizational form and asset characteristics that compete with existing open-end index mutual funds.

Mutual funds have existed for almost seven decades and offer a wide range of products and benefits to their investors. Index funds represent about $1.5 trillion of mutual fund industry assets. However, a decade ago, a new fund type, the ETF, was introduced. This product became very popular, especially in the last several years, suggesting that there was a room for improvement on the existing index products. If ETFs are more efficient, then they should gradually replace conventional index mutual funds. However, this has not yet happened in reality. Observations show that, even though the products seem to be the same: a return that tracks an index, the outcomes of investing through a conventional index fund versus an ETF can be different based on investor-specific circumstances. This study addresses whether conventional mutual funds and ETFs are substitutes, and how their coexistence in the market can be explained.

The main differences between conventional index funds and ETFs are associated with the trading options of fund shares for individual investors, and fee and tax implications created with those options. ETFs have lower fund level fees due to the elimination of individual investor accounting by ETFs, as this function is shifted to brokers. Also, ETFs are perceived to be more tax efficient, as their organizational structure allows them to efficiently minimize capital gain distributions. Data analysis shows that, on average, ETFs have smaller tracking errors and are more efficient after expenses.

The results of the study demonstrate that conventional and exchange traded index funds are substitutes, showing that if ETFs are more efficient in terms of performance, then, aggregated by index, one dollar of the flows of ETFs will take about 22 cents of regular funds' flows. However, though the fund level fees of ETFs are lower than those of conventional funds, brokerage fees and commissions that investors have to pay for trading ETF shares may increase total investor expenses in certain conditions. The coexistence of two types of index funds can be explained by a clientele effect, which puts the two types in different market niches. A test of clientele reveals that ETFs and regular funds are not perfect substitutes, and each is preferred by a different type of investor. Specifically, the results show evidence of a tax clientele, suggesting that ETFs are chosen by tax sensitive investors, while conventional funds may be preferred by tax exempt or insensitive investors who value services of mutual funds. A test for institutional clientele did not reveal a significant difference between the reactions of institutional and retail investors to the availability of ETFs.

The remainder of the paper is organized as follows. Section 2 provides a literature review. Section 3 compares index mutual fund and exchange traded fund investments, examines the reasons behind investors' choices between a conventional fund and an ETF, fund type substitutability, and performance differences and characteristics. Data and empirical analysis are given in Sections 4 and 5, respectively, and Section 6 concludes.

2. Literature review

An extensive pool of literature exists on conventional mutual funds, covering different aspects of the mutual fund industry, such as performance, management, and fund structure (e.g., Sirri and Tufano (1998), Edelen (1999), Elton et al (1993), and Carhart (1997) among many others.). However, very few studies are available on ETFs, including those that compare conventional mutual funds with ETFs. The main reason for this is the short time period for which ETFs have existed, and the lack of availability of related data. Conventional mutual funds were created in the 1940s and increased in popularity in the 1970s. The fist ETF was created in 1993, though awareness and active use by investors have increased in recent years.

The mutual fund literature on index funds, specifically, the research that looks at performance, costs, and tracking errors, is relevant to this paper for analysis of both conventional and exchange traded index funds. The main question raised in the literature is about the tradeoff between enhanced returns and the tracking error of index funds. It is widely known that stocks added or removed from the S&P 500 index experience abnormal returns on announcement. Index fund managers could trade on the date of announcement instead of the actual change date and enhance the return of the fund. However, that would increase the tracking error, and to achieve the low tracking errors observed in practice, an indexer must closely follow the exact replication strategy. Blume and Edelen (2003, 2004) show that a strategy for S&P 500 indexers of trading at the open following the announcement of a change, rather than at the change, adds 19.2 basis points to the return per year with almost no added risk, but with substantial increase in the tracking error. Blume and Edelen (2003, 2004) argue that this additional return is a measure of the delegation cost in monitoring an indexer through a tracking error, and show that less than half of the studied indexers always follow the exact replication strategy, consistent with the hypothesis that these indexers are trying to recoup some of these delegation costs.

Gastineau (2004) addresses a similar issue relative to ETFs, examining the performance of index ETFs relative to the benchmark and conventional index funds. Instead of focusing on the tax efficiency of the ETF structure, Gastineau (2004) looks at the operating efficiency of index funds. By employing the strategy discussed in Blume and Edelen (2003, 2004), Gastineau (2004) shows that conventional index funds outperform by making transactions at some time other than the market close on the last day of formal index rebalancing. Gastineau argues that a structural weakness in current ETFs is a part of the explanation for their underperformance, and argues that a change in portfolio management policy will permit ETFs to perform in line with conventional funds on a pre-tax basis and, presumably, outperform them on an after-tax basis in the long run due to tax-efficiency of the ETF structure. Elton et al. (2002) also investigate the performance of ETFs relative to the underlying index benchmark. Specifically, they examine the characteristics and performance of SPDR (Spiders) ETF and find that its net asset value is kept close to market price by its ability to create and delete shares by in-kind transactions. The results of the paper show that SPDR underperforms the S&P 500 Index by 28 basis points and low-cost index funds by 18 points. Elton et al.'s (2002) explanation is the lost income caused by holding dividends received on the underlying shares in cash.

However, in spite of the documented performance disadvantage, the ETF is still considered to be an important instrument because of its organizational form. ETFs are widely discussed as a prototype for the mutual funds of the future. ETFs seem to offer the benefits of both open-end and closed-end funds. In particular, they trade close to net asset value (NAV), and, like closed-end funds, they offer the ability to transact at the market price at any point during the trading day. ETFs avoid the disadvantages of closed-end funds for which prices may deviate widely from NAV, and the disadvantages of open-end funds that are priced only once a day, and, in addition, often have restrictions or minimum limits on sales and purchases by customers.

Most of the studies, including those mentioned above, are based on a limited sample of funds, and the results are representative only of big funds that have a significant share and presence in the market. That is justifiable and valuable, but a broader study on more comprehensive data is necessary to make more accurate conclusions. One of the goals of this paper is to conduct such a study.

Another aspect that has been examined in the literature is the impact of capital gains taxes on after-tax returns for shareholders of conventional index mutual funds. Interestingly, the majority of these studies were conducted before ETFs were introduced to the market. Mutual funds are organized in such a way that they pass through all capital gains to the investors. The problem of capital gains realization within mutual funds due to the rebalancing of existing portfolios and the tax implications on shareholders is widely recognized by both academics and practitioners. One way to deal with this problem is to implement a special trading strategy that would offset realized capital gains. Dickson and Shoven (1994) examine the feasibility of managing open-end and closed-end S&P 500 index funds in order to defer net capital gains realization. They show that it is possible to incorporate certain features of the U.S. tax laws, i.e., wash-sale rules and the offsetting of short-term and long-term capital gains and losses, for potential improvements in post-tax returns to the investors engaged in tax minimization strategies. However, active management of index funds would deviate from funds objectives and impose the problem of increased tracking error, i.e. there is a tradeoff between reduced capital gains and increased tracking error.

The introduction of ETFs to the market alleviated the problem of managing capital gains realization. Poterba and Shoven (2002) examine the perception of ETFs being more tax efficient than traditional equity mutual funds by comparing the pre-tax and after-tax returns on the largest ETF, the SPDR trust, with returns on the largest equity fund, the Vanguard Index 500 fund. The results suggest that, between 1994 and 2000, both the before- and after-tax returns on the SPDR and Vanguard Index 500 fund were very similar. The argument for tax efficiency is that by reducing the tax burden on investments in corporate stocks through ETFs relative to investments in the same stocks through equity mutual funds, ETFs may move closer to the consumption-tax treatment of corporate capital income. Plancich (2003) looks at mutual fund capital gains distributions and the tax reform act of 1997, which made long-term capital gains less taxable, and finds that managers appear to tilt their distributions towards the long-term after 1997. The reason for them to do so is to make their returns more attractive after-tax and to attract more cash flows. This implies that investors are tax sensitive and prefer higher after-tax returns on their investments.

However, no existing study, to my knowledge, examines how the characteristics of exchange traded and conventional mutual funds define their roles in the market, or addresses the prospects of their coexistence and future development. If these two kinds of index instruments coexist in the long term, despite their similarities, their intricate differences in characteristics and their implications should explain this coexistence. For example, some of the reasons for using ETFs as opposed to conventional index funds can be (i) tax efficiency and (ii) investors' need for immediacy and trading options, which can be used for controlling risk and short-term trading. A reason why both ETFs and conventional index funds are found in the marketplace can be, for example, the result of a clientele effect. The low rate of taxable distributions on ETFs may make them more attractive to equity investments outside of tax-deferred accounts, such as IRAs or 401(k)s. At the same time, some attributes of traditional equity mutual funds may make regular funds more attractive for retirement account investors. Also, ETFs may be a part of an emerging trend toward segmentation of the mutual fund marketplace, with frequent traders segregated into products different from those preferred by low-turnover investors.

The challenge of constructing empirical tests of the clientele effect and market segregation is caused by the poor availability of data on individual investor trades. Kostovetsky (2003) compares two methods of passive investment using a model that is helpful in examining major differences between ETFs and index funds. This model is based on investor trading preferences, tax implications, and other characteristics. Kostovetsky (2003) shows that the key areas of differences between the two instruments are management fees, taxation efficiency, and other qualitative differences. I take these differences into account in my empirical tests.

The intended contribution of this paper is to conduct a thorough comparative study of the performance, cost, and efficiency of ETFs and index funds using a more comprehensive data set, and to test for substitution and clientele effects.

3. Comparison of conventional and exchange traded index funds

3.1 History of ETFs

The period of introduction of ETFs to the market corresponds to the period of research related to problems associated with non-tradability and the organizational structure of conventional mutual funds.[22] Before ETFs of modern form where developed, some pioneer forms came to the market. As described by Gastineau (2001, 2002), the history of ETFs starts with Index Participation Shares (IPS), which tracked the S&P 500 index and were first traded in 1989. The IPS was followed by Toronto Stock Exchange Index Participations (TIPs) and Supershares. The first ETF to start trading on Amex in 1993 was Standard & Poor's Depository Receipts (SPDRs), with a structure of a unit trust. Later, other exchange-traded index products were developed with a structure similar to mutual funds as opposed to unit trusts. One of the earliest of this type is World Equity Benchmark Shares (WEBS) – now iShares MSCI Series. Currently, as of September 2005, about 180 ETFs are available to investors (Investment Company Institute (ICI) report and etfconnect.com). The funds are offered by ten different sponsor companies and provide a large variety of domestic and international underlying indexes and assets.

3.2 Conceptual differences between ETFs and conventional open-end index funds

The first and the most important difference between ETFs and conventional open-end index funds is that ETFs are traded in the secondary market at the price prevailing at that moment, and not at NAV. ETFs can be purchased or sold at any time during a

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[22] For example, research on capital gains realization and taxation of mutual funds (Dickson and Shoven (1994), and Bluoin et al (2000)).

trading day unlike conventional mutual funds, the shares of which can be exchanged directly with the funds only at the 4 pm NAV as determined by the funds. This option of intraday trading may not necessarily be valuable to every investor; however, it may appeal to investors who are concerned about the ability to get out of a position before the market is closed when prices are volatile.

Primary market transactions in ETFs consist of in-kind creations and redemptions in large sizes. This is another important characteristic of the organizational structure of ETFs that distinguishes them from conventional funds. The ability to trade like stocks in the secondary market makes ETFs similar to closed-end mutual funds, but the feature of in-kind creations and redemptions makes ETFs very distinct from all other types of managed portfolios. This also allows ETF managers to deal with the problem of premiums and discounts due to divergence between price and NAV. The possibility of intraday creations or redemptions is a significant factor in maintaining ETF prices extremely close to NAV.

Also, redemption-in-kind can improve the tax efficiency of ETFs, which is important for the majority of investors. In contrast, most redemptions of conventional funds are for cash, and, in the case of significant fund holder redemptions, a fund is required to sell shares of the portfolio that may have appreciated from their original cost.[23] This procedure can realize capital gains, which have to be distributed to all shareholders, and even continuing investors have to pay taxes on these distributions. ETFs, however, take advantage of a special tax treatment through redemption-in-kind, thus improving their tax efficiency. In such a scenario, the low cost basis shares of each

[23] Redemption-in-kind in conventional funds is allowed on large amounts with a minimum of $250,000; however, funds are reluctant to do so. In addition, the majority of investors have positions smaller than the specified minimum.

stock in an ETF's portfolio are delivered against redemption requests. Conventional funds, in contrast, try to sell their highest cost basis stocks first, leaving the cost basis of the portfolios low and, therefore, making funds subject to higher capital gains later, e.g. in case a particular stock leaves the index and the portfolio needs rebalancing. With ETF in-kind redemptions, a fund portfolio has a relatively higher cost basis, which means that acquired stocks generate smaller gains when they leave the index. There are two types of capital gain tax liabilities: when investors sell fund shares (controlled by the investors), and for funds' activities independent of investor trading (not controlled by the investors). ETFs create tax efficiency for the latter type, making ETFs more attractive for tax sensitive investors.

Since ETFs are traded just like any stock, ETFs and conventional funds also differ in distribution channels, which is another important factor. The shares of an ETF must be purchased through brokerage firms, which entail commission costs, such as brokerage fees and a bid-ask spread. In contrast, conventional fund's shares can be purchased directly from the fund. Therefore, shareholder accounting for ETFs takes place at brokerage firms rather than at the funds. Elimination of the individual shareholder transfer agency function reduces operating costs.[24] The expenses of ETFs tend to reflect the cost savings on this function (see data description in Table 3). However, even if operating costs are reduced, an individual investor may face different marginal costs when investing through ETFs due to brokerage fees, commissions, and bid-ask spreads. Thus, depending on the investor's trading activity and the volume of trade, the costs and,

[24] One of the traditional functions of the mutual fund transfer agent is to keep records of fund position placements, so that ongoing payments based on 12b-1 fees or other marketing charges can be allocated to the appropriate persons.

therefore, preferences of investing through an ETF versus a conventional fund can differ among types of investors.

In addition, ETFs can be purchased on margin and sold short, and some ETFs have traded options, which are not available for conventional mutual funds. These features can be important for investors who perform risk management, and may be especially useful for institutional investors who are looking to hedge large-sized contracts. In this case, ETFs are attractive because they have a large variety in tracked indexes, and, unlike futures contracts, they do not expire.

On the other hand, ETFs and conventional index funds have many similarities. Both have operating expenses, which reduce investors' returns. Most ETFs to date have been designed to track a specific market index, similar to the way conventional index funds do. Both ETFs and conventional index funds may experience tracking errors in matching pre-tax returns on their tracked indexes (Blume and Edelen (2003, 2004), Gastineau (2004), Elton et al (2002)).

However, even though ETFs and conventional index funds offer similar products, the differences listed above suggest that they may be preferred by different types of investors. ETFs may be preferred by intraday investors who demand short-term liquidity or immediacy in trade, by long-term investors who buy in large amounts and seek lower management fees, by hedgers and speculators because of options traded on ETFs that allow for minimizing exposure or maximizing profits through leverage, and by investors who are tax sensitive due to the tax-efficiency of ETFs. On the other hand, conventional index funds would be preferred by active investors who make many small purchases or sales due to no commission costs, by those who place less value on liquidity or immediacy in trade, and by those who are tax exempt or less tax sensitive.

3.3 Hypotheses formulation

What motivates index investors to choose either a conventional mutual fund or an ETF? These funds provide the same product in that they earn a return on some market index, but have differences in operation that can be advantageous for certain types of investors.

Based on the predictions of economic theory, substitutes, complements, and independent products have different quantity reactions to price changes of other products. Fund fees, returns, and tracking errors are notable determinants of investors' demand. Depending on the cross product relationship between conventional index funds and ETFs, investors would react differently to relative variances in fee changes in conventional index funds and ETFs. If these two fund types are indeed good substitutes, then due to the fee and trading advantages of ETFs, conventional index funds would be expected to gradually disappear or lose a significant share of the market. We do observe ETFs gaining market share. However, the loss in the market share of conventional index funds appears to be due to fund industry growth, including growth in ETFs, but not due to the outflow of assets from conventional index funds (Fig. 1 and 2). Thus, even if they are substitutes, this effect of a negative flow relationship between the fund types may be diminished or emphasized by competitive actions that the funds may take.

Conventional index funds facing competition from ETFs are pressured to make adjustments in operations to match the level of fees to that of ETFs. For example, Fidelity reduced fees in October 2004. This was followed by other funds (Economist, September 2004). For ETF investors, lower costs at the fund level may not necessarily translate into lower costs at the investor level due to brokerage fees, commissions, and bid-ask spreads, which may differ on an individual basis.[25]

Non-price competition, on the other hand, as reflected in different organizational structures and services provided, may diminish the substitution effect by segregating investors into different niches. In this case, ETFs would not be expected to completely drive conventional index funds out of the market.

3.3.1 Substitution effect

The analysis starts with examining whether conventional index funds and ETFs are substitutes, and what implications this may have for development of the industry. Based on the similarities of the underlying products, these two types of index investment are expected to be substitutes, which should be reflected in fund flow relations.

Hypothesis 1: If conventional mutual open-end index funds and ETFs are substitutes, then they will have a negative fund flow relation.

If the two products are substitutes, then demand for these products and the level of the substitution relation will be determined by their prices. In the fund industry, demand can be measured by assets allocated or fund flows, and the price can be measured by fund fees or returns adjusted for fees. Thus, in price competition, funds may either reduce fees or enhance their performance through returns. However, for index funds, an additional measure of performance is a tracking error. Therefore, two main criteria for

[25] Therefore, in addition to comparing performance net of fund fees, it is important to look at the investor level account performance net of all fees.

exchange traded and conventional index funds' evaluation are the size of the tracking error and total fees. The funds with smaller value of both of these criteria will generally be able to attract more of investors' money. The organizational structure implies, and data indicate, that ETFs have lower fees. A detailed analysis of the tracking error and fees is available in a later section of this paper.

Besides the differences in prices, the two fund types differ in organizational structure, trading, and tax implications. ETFs have some non-price advantages, which can enhance the substitution effect. However, if different investors value these benefits differently, it can also reduce the substitution effect, leading to a clientele effect, which may explain why conventional index funds and ETFs can coexist in the longer term.

3.3.2 Clientele effect

One of the advantages that ETFs have with their organizational structure is tax efficiency. As ETFs can realize fewer capital gains, they impose less tax on individual investors. Other things being equal, ETFs should generally be preferred to conventional funds by tax sensitive investors. Another advantage of ETFs is intraday trading at the prevailing price rather than at stale NAV and additional trading options like short selling, margins, and, sometimes, derivatives. Therefore, ETFs should generally be preferred to conventional funds by intraday active traders, hedgers, and speculators, because ETFs give more flexibility in trading and provide more options for risk management. However, these trading options of ETFs do not come free: They involve brokerage fees and commissions, which may increase total expenses for investors. This presents a tradeoff between the added benefits of the structure of ETFs and additional costs related to those benefits. Various investors may have different break-even points, and, therefore, the choices of fund types (regular or ETF) may be different. Thus, coexistence of conventional and exchange traded index funds may be explained by the clientele effect.

Hypothesis 2: ETFs are preferred by investors with higher liquidity and trading needs and/or higher marginal taxes.

This segregation of investors is partially due to the existence of brokerage fees on ETF transactions for individual investors. An important criterion that investors consider for their asset allocation is the cost associated with the investments. If an investor has to make many small purchases, then the total cost of the investment may be high, even if ETFs' fund level fees are generally lower than fees of similar conventional funds. For the long-term investor who plans to make one large lump-sum investment, an ETF may be a good choice, as ETFs' annual fees are on average lower than those of regular funds. This may be a clientele effect based on investors' time horizon: Long-term investors prefer ETFs due to lower management fees, and short-term active investors prefer mutual funds due to no commission costs.

Another criterion that investors take into account is the tax consequence of the investment. ETFs are generally expected to be more tax efficient than regular index funds due to their organizational structure. Retirement accounts are either tax exempt or tax deferred, and, therefore, investors in those accounts may not gain additional value in ETFs' tax efficiency. Also, institutional investors may not necessarily be very tax sensitive, because they pass through their tax liability to individual investors.[26] This is tax clientele, and investors' choices between ETFs and conventional index funds are

[26] Though, if an individual investor, a final tax-payer, is tax sensitive, then institutional funds will tend to be more tax sensitive to attract more flows.

expected to be as follows. Tax sensitive investors would generally prefer ETFs, while tax insensitive investors would prefer conventional index funds for the additional services provided.

The next criterion that some investors value in ETFs is the availability of trading options. Investors more sensitive to volatility, such as hedgers, speculators, and intraday traders, would generally prefer ETFs. The majority of individual investors do not represent this group of investors. Institutional investors, however, can take advantage of intraday pricing and trading options, and are expected to prefer ETFs. This leads to institutional clientele.

Supporting arguments for the above statement follow. The dollar value of a transaction for an institutional investor is usually high, which reduces brokerage fees as a proportion to the invested amount. In contrast, retail investors' transactions are smaller. In addition to the common benefits that ETFs offer to institutional and retail investors, institutional investors may better benefit from the wide array of risk management and investment strategies, such as equitizing cash, managing cash flows, equity/fixed income asset allocation, sector/country exposure, hedge strategies, relative value and long/short strategies, and transitions.

As ETFs are expected to be more suitable for institutional investors if ETFs and conventional funds are substitutes (Hypothesis 1), then the substitution effect between institutional index funds and ETFs should be larger than the substitution effect between retail index funds and ETFs.

4. Data sources and descriptive statistics

Several data sources are used for the analysis. The aggregate data from ICI are used for analysis of industry trends, and are presented in Table 1 and illustrated by Fig. 1. Overall, from 1993 to 2004, assets of equity mutual funds grew substantially, indicating an increase in investors' interest in this type of investment. During 2000-2003, equity mutual fund assets decreased; however, ETFs showed steady growth during the same period of time. Between 1993, the year the first ETF was introduced, and 2004, assets held by equity mutual funds increased almost six times. Over the same period, ETFs grew from almost no assets to 5% of assets in equity mutual funds. Fig. 2 (obtained from Economist print edition Sep 23rd 2004) shows the market shares of conventional index funds and ETFs for the 1996-2004 time period. The figure indicates that the share of conventional index funds remained almost unchanged from 1999 to 2004, staying at around 8%, and the share of ETFs increased significantly to about 5% in 2004.

The primary source of the fund level data for both conventional index funds and ETFs is the Center for Research in Security Prices (CRSP) survivor-bias free US mutual fund database. The complete data set on ETFs is only available for the years after 2000. Thus, I restrict the study period to range between 2000 and 2004.

The study is done by matching ETFs with conventional index funds tracking the same indexes. The conventional index fund list is obtained from www.indexfunds.com, and the ETF list is collected from www.etfconnect.com.[27] From a universe of 180 ETFs and 369 conventional index funds, nine indexes tracked by both types of funds were identified, giving a sample of 171 conventional index funds and 11 ETFs (see Appendix).

[27] Wharton Research Data Services refers to the same source used by researchers to identify index funds.

The mutual fund industry aggregate data come from the ICI website. Index return data are collected from index providers. The sample is an uneven panel of monthly fund data aggregated by tracked indexes between 2000 and 2004. The number of funds per time period may differ due to the introduction of new funds.

Table 3 presents the descriptive statistics of ETFs and conventional index funds, separated into institutional and retail funds, and grouped by index, during the 2000-2004 time period. The statistics indicate that more retail than institutional funds exist within each index group, and each group has more conventional funds than ETFs. Retail funds are, on average, larger than institutional funds within an index group. ETFs are, on average, larger than conventional funds for six out of nine indexes. Expense ratios are the lowest for ETFs. Conventional institutional funds are substantially cheaper than retail funds. For most of the indexes, ETFs did not have capital gains distributions. Conventional index funds had capital gains distributions averaging around $0.2 million per year. On average, flows to ETFs were positive and substantially higher than those to conventional index funds. Retail funds experienced negative average flows for several indexes during the study period.

5. Empirical analysis

5.1 Performance

Before testing the main hypotheses, the performances of ETFs and conventional index funds are studied. Due to variations in organizational structure, a source of performance differences would come from differences in the ability to react to index change announcements and related tracking error effects (Blume and Edelen (2004), and

Gastineau (2004) among others). Performance differences also come from fund expenses, measured by expense ratios. ETFs are expected to have lower expense ratios due to their exemption from individual account bookkeeping.

Recent developments in the mutual funds industry show that price competition exists not only among conventional funds but also between conventional funds and ETFs. For example, in October 2004, the Fidelity fund family reduced fees on its five main equity index funds to a tenth of a cent per dollar invested (Economist, September 2004). Other funds follow similar strategies to effectively compete against comparable ETFs. These adjustments in fees may be another indicator that conventional index funds and ETFs are, indeed, substitutes, and that facing an increase in competition due to the introduction of ETFs, conventional mutual funds search for new ways to attract investors.

Performance tests are done by conducting univariate analyses of effectiveness and the tracking error of regular index funds and ETFs. Effectiveness is measured as the difference between fund return and tracked index return. Tracking error is an absolute value of the effectiveness variable. Means are calculated in each index group of funds, and the means of the two groups are compared. Table 2 presents the results of the univariate analyses of effectiveness and tracking error. Panel A shows the statistics for the differences between gross fund returns and index returns and for absolute values of the differences. The means of these variables are calculated as the averages across the funds that track one of the nine studied indexes. Then, t-statistics are calculated to test whether the means are statistically different from zero. Further, a difference in means between conventional index funds and ETFs is calculated for each index and tested for statistical significance. For five out of the nine indexes, conventional funds have positive means of effectiveness that are significantly different from zero, while ETFs show this result for only one index. For two indexes, Russell 2000 and S&P 500, the means of effectiveness are statistically different for conventional funds and ETFs, indicating that conventional funds have higher effectiveness in gross returns. The absolute value of effectiveness, i.e. tracking error of gross returns, is statistically different from zero at less than the 1-percent level for fund types and for all indexes. The difference in tracking error between conventional funds and ETFs is positive and statistically significant at less than the 1-percent level for all but Dow Jones Industrial indexes, indicating that ETFs generally track underlying indexes with gross returns better than conventional funds.

Panel B presents similar statistics for net returns. On average, conventional funds underperformed four and outperformed one out of nine indexes, with statistical significance at less than the 5-percent level. ETFs, on average, underperformed six and outperformed one out of nine indexes with statistical significance at less than the 1-percent level. However, differences in the means between groups of funds indicate that the magnitude of underperformance is smaller for ETFs for three indexes at less than the 10-pecent level. The means for the other indexes are not statistically different from each other. The tracking error of net returns is statistically different from zero for both fund types and for all nine indexes at less than the 1-percent level. The differences in means indicate that ETFs have smaller net tracking error for eight out of nine indexes at less than the 1-percent level.

Conventional funds and ETFs have noticeable differences in sample size. To control for this, first, the averages of net returns across funds are calculated for each index, and index returns are then subtracted, giving the effectiveness measure. Panel C presents the results for this measure. On average, conventional funds underperformed three and outperformed one out of nine indexes with statistical significance at less than the 10-percent level. ETFs, on average, underperformed six and outperformed one out of nine indexes with statistical significance at less than the 1-percent level. However, the mean difference of effectiveness between regular funds and ETFs was statistically significant at less than the 5-percent level only for one index, and this was in favor of ETFs. Results for tracking error are the same as reported in Panel B.

Thus, it may be concluded that on average, ETFs have smaller tracking errors and are more effective in returns after fees.

5.2 Substitution effect

The best way to test for the substitution effect between index funds and ETFs is to look at the individual investor level choices by following trades in personal investment accounts. As conventional index funds and ETFs buy similar underlying products, we would expect that both enter an investor's utility function. However, data at the individual investor level are not available. To overcome this problem, all investors in the economy are looked at in aggregate and considered as a single representative investor. Therefore, aggregate flows to conventional index funds and ETFs are used as the indicator of the representative investor choice, and the substitution effect between funds is tested with the following model of a system of equations.

$$\begin{aligned} FlowRF_{i,t} &= \alpha_{i,t} + \beta_1 FlowETF_{i,t} + \beta_2 lagFlowRF_{i,t} + \beta_3 lagFlowETF_{i,t} + \beta_4 FlowIndustry_{i,t} + \\ &\quad \beta_5 lagIndexRet_{i,t} + \beta_6 Ret_{i,t} + \beta_7 lagRet_{i,t} + \beta_8 Expenses_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

$$\begin{aligned} FlowETF_{i,t} &= \alpha_{i,t} + \beta_1 FlowRF_{i,t} + \beta_2 lagFlowRF_{i,t} + \beta_3 lagFlowETF_{i,t} + \beta_4 FlowIndustry_{i,t} + \\ &\quad \beta_5 lagIndexRet_{i,t} + \beta_6 Ret_{i,t} + \beta_7 lagRet_{i,t} + \beta_8 Expenses_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t} \end{aligned}$$

where dependent variables are flows to regular funds (*FlowRF*) and to ETFs (*FlowETF*). Flows are measured using the methodology of Sirri and Tufano (1998) and are calculated as: $Flow_{i,t} = TNA_{i,t} - TNA_{i,t-1} * (1 + R_{i,t})$, where $TNA_{i,t}$ is fund i's total net assets at time t, and $R_{i,t}$ is the fund's return over the prior month. $Flow_{i,t}$ reflects the dollar growth of a fund in excess of the growth that would have occurred with no fund flows and all dividends reinvested.

Explanatory and control variables include: lagged flows to ETFs and regular funds; lagged index return; current and lagged return in regular funds and ETFs, calculated as the value-weighted average across funds tracking the same index; expense ratio; and the log of TNA, also calculated as the value-weighted average across funds tracking the same index. Return, lagged return, expense ratio, and the log of TNA on the right hand side of the equations are of those funds whose flows are on the left hand side of the model. Flow to industry is measured as the sum of flows to equity, bond, and hybrid mutual funds net of flows to index funds.

If both of the β_1 coefficients are positive, then I cannot reject the hypothesis that conventional index funds and ETFs are complements. However, if either of the β_1 coefficients is negative, then I can reject the hypothesis and conclude that conventional index funds and ETFs are substitutes.

The rest of the variables are for control purposes, with the following expected contributions. Flows to the mutual fund industry indicate investor sentiment and level of industry investment, and β_4 is expected to be positive. Lagged index return measures the attractiveness of index products. Current and lagged returns of a fund are performance measures used in equity funds flow studies (Sirri and Tufano (1998)). Expenses measure investors' costs and are expected to have a negative relation to the flows. Total net assets are used to control for a size effect.

To test the substitution effect hypothesis, I use regular OLS. However, to control for the endogeneity problem, where flows to regular funds and ETFs enter both equations as dependent and explanatory variables and may be endogenously determined, I use the seemingly unrelated regressions (SUR) approach. For both OLS and SUR, I control for fixed effects by including year and index dummy variables.

Table 4 presents the results of the tests for substitution effect. Coefficients β_1 on flows to regular funds and ETFs in both equations are negative and statistically significant at less than the 1-percent level with all test specifications, i.e. OLS and SUR with fixed year and index effects. Therefore, I can reject the null hypothesis that conventional funds and ETFs are complements and conclude that they are substitutes in attracting investors' flows. Also, results show that fund flows are positively related to lagged flows for both conventional index funds and ETFs under the SUR fixed year effects specification. This result also holds for conventional index funds with the other model specifications. Flows to conventional index funds are also positively related to the industry flows. Flows to ETFs are positively related to fund returns with the significance level at less than 5 percent. SUR with fixed year effects indicates that flows to ETFs are negatively and flows to conventional index funds are positively related to fund expenses, and both fund types are positively related to fund size.

5.3 Clientele effect

5.3.1 Tax clientele

To test the tax clientele hypothesis, I use a natural experiment of changes in tax law and in capital gains tax rates. Before 1997, any asset sold, regardless of the holding period, was taxed as ordinary income subject to a maximum rate of 28%. After May 6, 1997, the maximum rate on long-term capital gains fell to 20%, while short-term capital gains distributions remained taxed at the ordinary income rate, which can be as high as 39.6%. The tax law change decreased the tax on long-term capital gains and made them more attractive, while the opposite happened for short-term capital gains. Mangers of mutual funds have the ability to adjust trades in a way to realize long-term gains instead of short-term capital gains. Plancich (2003) shows that managers appear to have tilted their distributions toward the long-term after 1997. Even if managers of index funds may not have as much flexibility when it comes to adjusting their portfolios, they still can to some extent. Therefore, I can use this tax change event to test the hypothesis of the tax clientele effect. I expect that, after the tax changes of 1997, the substitution effect between conventional index funds and ETFs should increase, as managers can make conventional index funds more attractive after tax by managing capital gains distributions. My data sample is limited to 2000-2004, and this change in tax law falls outside of the period of study. However, another favorable change in the tax rates on long-term capital gains happened in May 2003: The maximum tax rate was reduced from 20% to 15%, while the tax rate on short-term capital gains remained unchanged. I use the following model to test for a tax clientele effect around this specific event with a system of equations.

$$FlowRF_{i,t} = \alpha_{i,t} + \beta_1 FlowETF_{i,t} + \beta_2 After{*}FlowETF_{i,t} + \beta_3 lagFlowRF_{i,t} + \beta_4 lagFlowETF_{i,t} + \beta_5 FlowIndustry_{i,t} + \beta_6 lagIndexRet_{i,t} + \beta_7 Ret_{i,t} + \beta_8 lagRet_{i,t} + \beta_9 Expenses_{i,t} + \beta_{10} LogTNA_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowRF_{i,t} + \beta_2 After{*}FlowRF_{i,t} + \beta_3 lagFlowRF_{i,t} + \beta_4 lagFlowETF_{i,t} + \beta_5 FlowIndustry_{i,t} + \beta_6 lagIndexRet_{i,t} + \beta_7 Ret_{i,t} + \beta_8 lagRet_{i,t} + \beta_9 Expenses_{i,t} + \beta_{10} LogTNA_{i,t} + \varepsilon_{i,t}$$

where *After* = 1 for a period after May 2003 and is equal to zero otherwise, and *After*Flow* is an interaction term that captures the marginal effect of tax changes on flows to the funds. I expect β_2 in both equations to be negative, indicating that the tax change and the resulting lower tax advantage of ETFs create more of a substitution effect between conventional index funds and ETFs. The β_1 coefficient is still expected to be negative, showing a substitution effect between the fund types. The rest of the variables are defined as in earlier tests.

Another way to test for differences in the tax clientele between conventional index funds and ETFs due to tax efficiency is to include continuous variables for tax rates or capital gains distributions in the model. I expect the coefficients on these variables to be negative, as increases in taxes or capital gains distributions make conventional index funds less attractive to non-tax exempt investors relative to ETFs. The following model with a system of equations is used to test this hypothesis.

$$FlowRF_{i,t} = \alpha_{i,t} + \beta_1 FlowETF_{i,t} + \beta_2 CapGainsRF_{i,t} + \beta_3 CapGainsETF_{i,t} + \beta_4 lagFlowETF_{i,t} + \beta_5 FlowIndustry_{i,t} + \beta_6 lagIndexRet_{i,t} + \beta_7 Ret_{i,t} + \beta_8 lagRet_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowRF_{i,t} + \beta_2 CapGainRF_{i,t} + \beta_3 CapGainsETF_{i,t} + \beta_4 lagFlowETF_{i,t} + \beta_5 FlowIndustry_{i,t} + \beta_6 lagIndexRet_{i,t} + \beta_7 Ret_{i,t} + \beta_8 lagRet_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t}$$

where $CapGainsRF_{i,t}$ and $CapGainsETF_{i,t}$ are value-weighted capital gains distributions to regular funds and ETFs by index, respectively. The rest of the variables are as defined in earlier tests.

Table 5 presents the results of the tests for tax clientele between regular funds and ETFs. Panel A reports the results of the event study around the capital gains tax change. As expected, coefficient β_2 is negative and statistically significant at less than the 1-percent level in both equations. This indicates that as the tax advantages of ETFs over conventional index funds diminish, the two become better substitutes. The rest of the variables show similar results, as in the previous model of the substitution effect.

Panel B shows that the capital gains distributions of regular funds have negative effect on their flows, as was expected.

5.3.2 Institutional clientele

The hypothesis regarding the institutional clientele effect between retail and institutional investors and the intensified substitution effect between institutional index funds and ETFs is tested using the same initial model for the substitution effect, but separates the flows of regular funds into subsamples of institutional and retail funds. If ETFs are more suitable for institutional investors than for retail investors, then the β_1 coefficients are expected to be larger for the institutional subsample than for the retail group. I perform an F-test to determine whether coefficients in the two subsample regressions are statistically different from each other.

Since I use the SUR approach, there are some limitations on the inclusion of all variables in one equation in order to make a meaningful comparison of coefficients across regressions. However, I run fixed effects OLS on a model that includes flows to ETFs as a dependent variable, and both flows to institutional and retail conventional funds as explanatory variables. The model is as follows:

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowInst_{i,t} + \beta_2 FlowRetail_{i,t} + \beta_3 lagFlowInst_{i,t} + \beta_4 lagFlowRetail_{i,t} + \beta_5 lagFlowETF_{i,t} + \beta_6 FlowIndustry_{i,t} + \beta_7 lagIndexRet_{i,t} + \beta_8 Ret_{i,t} + \beta_9 lagRet_{i,t} + \beta_{10} Expenses_{i,t} + \beta_{11} LogTNA_{i,t} + \varepsilon_{i,t} \quad (4)$$

If there is a clientele effect between institutional and retail conventional funds, and if the former are better substitutes for ETFs, then, from this model, I expect both coefficients β_1 and β_2 to be negative, but β_1 to be larger in absolute value.

Table 6 presents the results of the tests for institutional clientele. Panel A reports the findings of the initial model (1) for a substitution effect on two separate subsamples. The coefficient of flows to ETFs with the dependent variable of flows to institutional funds is -0.108 and the coefficient of flows to ETFs with the dependent variable of flows to retail funds is -0.090, which are statistically significant at less than the 1-percent level. It could be suggested that institutional funds may be better substitutes for ETFs. However, the result of the F-test shows that only the coefficients of lagged flows to regular funds are statistically different from each other across subsample regressions.

Panel B presents the results from fixed effects OLS, where both flows to institutional and retail funds are included in one regression as explanatory variables. It shows that flows to both types of conventional funds have negative relations with flows to ETFs; however, the magnitude of this relationship is larger for retail funds, though the economic difference is not large.

5.4 Summary of results

The results of this study demonstrate that conventional index funds and ETFs are substitutes. If ETFs are better performers, then one dollar of ETFs' flows will take about 22 cents of flows from regular funds. If conventional funds are better performers, then one dollar of regular funds' flows will take about 1.3 dollar of ETFs' flows. Competition between the fund types mainly comes through fund expenses and the tracking error. Univariate analysis shows that ETFs' expense ratios and tracking errors are generally lower than those of conventional funds. Therefore, as better performers, ETFs are gaining a share of the market at the expense of regular funds, as Fig. 2 presents.

However, if ETFs and conventional funds were perfect substitutes while ETFs suited investor preferences better, then we would not observe these two types of funds continuing to coexist. This paper shows that ETFs and regular funds are not perfect substitutes, and clientele effects exist between the two that separate them into different market niches. By using an event study approach, I find evidence of tax clientele, suggesting that ETFs are generally chosen over conventional index funds by tax sensitive investors. A test for institutional clientele did not reveal significant differences between institutional and retail investors' reactions to the availability of ETFs.

6. Conclusion

This paper examines one type of financial product innovation and studies how this innovation influences investors' choices. The introduction of exchange traded funds to the market has been a successful innovation, as reflected in the rapid growth of their market share and their popularity in the investment industry. I study how existing products, conventional open-end index mutual funds specifically, share the market and compete with ETFs. Similar to innovations in other investment products, such as contracts in the futures market, the introduction of ETFs has increased competition in the index fund market. This has benefited investors. I analyze whether conventional index funds and ETFs are substitutes and whether different features of these funds create clientele effects, extending competition beyond prices.

The study illustrates that conventional index funds and ETFs are substitutes. However, introduction of the new product, the ETF, did not replace the existing product, the conventional index fund. Rather, it created a new contract that added to the completeness of the market by offering new features previously unavailable in the regular funds. I find that conventional funds and ETFs are close, but are not perfect substitutes, as they may be preferred by different clienteles due to differences in the characteristics of the two fund types. This innovation is useful to both investors and the market, as it creates healthy competition in prices as well as service and product features.

Appendix

Index	Conventional Funds		ETFs
	Retail	Institute	
Barra Large Cap Growth	3	2	1
Barra Large Cap Value	1	3	1
Barra Small Cap Growth	1	1	1
Dow Jones Industrial	4	0	1
Russell 2000	8	4	1
Standard & Poors Midcap 400	6	4	2
Standard & Poors Smallcap 600	5	2	1
Wilshire 5000	10	6	1
Standard & Poors 500	75	36	2
All indexes	113	58	11

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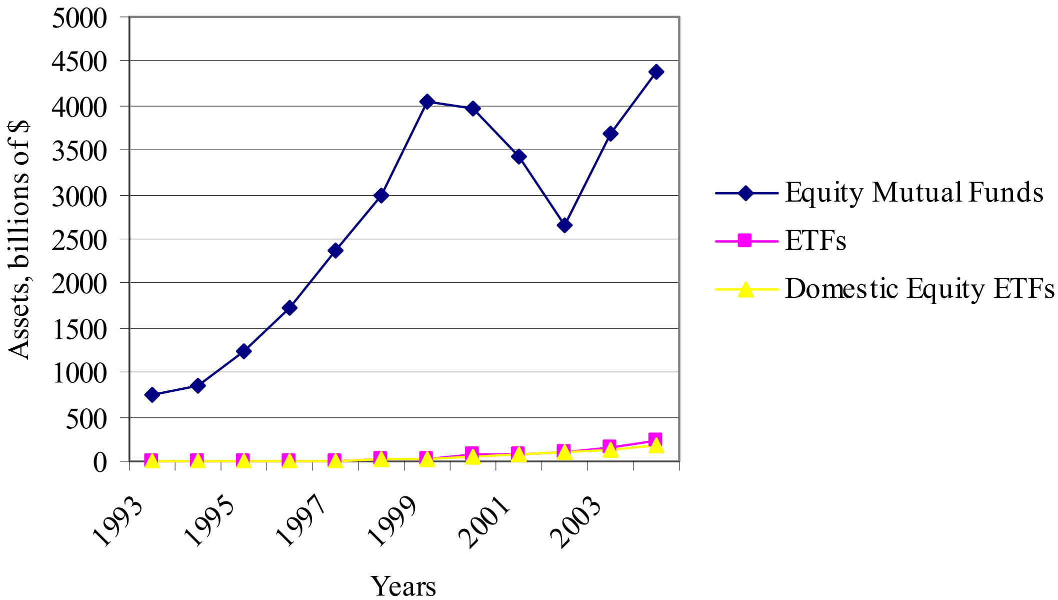
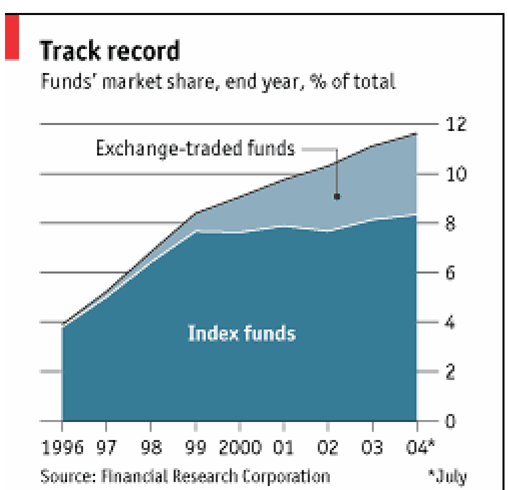
Figure 1
Assets in Equity Mutual Funds and Exchange Traded Funds, 1993-2004



Source of data: Investment Company Institute

Figure 2
Exchange Traded and Index Mutual Funds' Market Share, end of year, % of total



Source: Sep 23rd 2004, New York. From The Economist print edition

Table 2.1. Assets in Equity Mutual Funds and Exchange Traded Funds, 1993-2004

Source: Investment Company Institute website
Assets are given in billions of dollars.

	Equity Mutual Funds		Exchange traded Funds		Domestic Equity ETF	
Year	Assets	Number	Assets	Number	Assets	Number
1993	740.67	1586	0.5	1	0.5	1
1994	852.76	1886	0.4	1	0.4	1
1995	1249.08	2139	1.1	2	1.1	2
1996	1726.01	2570	2.4	19	2.2	2
1997	2368.02	2951	6.7	19	6.2	2
1998	2978.23	3513	15.6	29	14.5	12
1999	4041.89	3952	33.9	30	31.9	13
2000	3961.92	4385	65.6	80	63.5	55
2001	3418.16	4716	83.0	102	80.0	68
2002	2663.01	4748	102.1	113	93.0	66
2003	3684.80	4601	151.0	119	132.3	72
2004	4381.50	4551	226.2	151	184.0	102

Table 2.2. Univariate Analysis of Effectiveness and Tracking Error: Conventional versus Exchange Traded Index Funds

This table presents the descriptive statistics of effectiveness and tracking error of monthly gross returns at the index level, measured in percentage. Effectiveness is a difference between fund gross return and return on the tracked index. Tracking error (TE) is the absolute value of the effectiveness measure. Corresponding statistics, along with t-tests for the difference in means, are provided for the sample of 171 conventional and 11 exchange traded index funds tracking nine indexes. The full sample contains 9,692 fund-month observations for the 2000-2004 period. The symbols *, ** and *** indicate statistical significance at less than the 10-percent, 5-percent, and 1-percent levels, respectively.

Panel A	Conventional			ETF			Mean	$\mu_1 \neq \mu_2$	
Index	Mean	$\mu \neq 0$	Std. Dev.	Mean	$\mu \neq 0$	Std. Dev.	Difference	t stat	
Effectiveness: Gross TE=NetRet-indexRet+1/12Exp									
Barra Large Cap Growth	0.012		0.401	-0.001		0.020	0.013	0.52	
Barra Large Cap Value	0.012		0.374	0.000		0.013	0.012	0.46	
Barra SmallCap Growth	0.027		0.718	0.001		0.044	0.026	0.37	
Dow Jones Industrial	0.219		7.255	0.273		6.607	-0.054	-0.05	
Russell 2000	0.015	*	0.225	-0.003		0.032	0.019	1.85	*
Standard & Poors Midcap 400	0.029	**	0.252	0.004		0.104	0.025	1.57	
Standard & Poors Smallcap 600	0.024	*	0.267	0.004		0.021	0.021	1.55	
Wilshire 5000	0.160	***	0.905	0.119	***	0.178	0.041	0.97	
Standard & Poors 500	0.025	***	0.648	0.001		0.029	0.024	2.71	***
All nine indexes	0.040	***	1.101	0.035		1.999	0.005	0.06	
Gross TE=abs(NetRet-indexRet+1/12Exp)									
Barra Large Cap Growth	0.190	***	0.353	0.012	***	0.016	0.178	8.12	***
Barra Large Cap Value	0.186	***	0.324	0.009	***	0.009	0.176	7.97	***
Barra SmallCap Growth	0.376	***	0.611	0.020	***	0.039	0.356	6.04	***
Dow Jones Industrial	5.496	***	4.719	4.989	***	4.279	0.507	0.66	
Russell 2000	0.121	***	0.191	0.017	***	0.028	0.104	12.20	***
Standard & Poors Midcap 400	0.122	***	0.223	0.034	***	0.098	0.088	6.03	***
Standard & Poors Smallcap 600	0.131	***	0.234	0.011	***	0.018	0.120	10.25	***
Wilshire 5000	0.422	***	0.817	0.180	***	0.113	0.242	7.22	***
Standard & Poors 500	0.134	***	0.634	0.015	***	0.024	0.119	13.81	***
All nine indexes	0.251	***	1.072	0.492	***	1.937	-0.242	-2.81	***

Table 2.2. Continued

This table presents the descriptive statistics of effectiveness and tracking error of monthly net returns at the index level, measured in percentage. Effectiveness is a difference between fund net return and return on the tracked index. Tracking error (TE) is the absolute value of the effectiveness measure. Corresponding statistics, along with t-tests for the difference in means, are provided for the sample of 171 conventional and 11 exchange traded index funds tracking nine indexes. The full sample contains 9,692 fund-month observations for the 2000-2004 period. The symbols *, ** and *** indicate statistical significance at less than the 10-percent, 5-percent, and 1-percent levels, respectively.

Panel B	Conventional			ETF			Mean	$\mu_1 \neq \mu_2$	
Index	Mean	$\mu \neq 0$	Std. Dev.	Mean	$\mu \neq 0$	Std. Dev.	Difference	t stat	
Effectiveness: TE= (NetRet-IndexRet)									
Barra Large Cap Growth	-0.058	**	0.415	-0.016	***	0.019	-0.043	-1.66	*
Barra Large Cap Value	-0.004		0.374	-0.015	***	0.013	0.011	0.43	
Barra SmallCap Growth	0.016		0.696	-0.020	***	0.044	0.035	0.54	
Dow Jones Industrial	0.019		7.251	0.258		6.607	-0.239	-0.20	
Russell 2000	-0.044	***	0.235	-0.024	***	0.062	-0.020	-1.62	
Standard & Poors Midcap 400	-0.011		0.260	-0.015		0.101	0.004	0.25	
Standard & Poors Smallcap 600	-0.051	***	0.219	-0.013	***	0.023	-0.038	-3.43	***
Wilshire 5000	0.128	***	0.903	0.106	***	0.189	0.022	0.52	
Standard & Poors 500	-0.023	***	0.659	-0.008	***	0.028	-0.015	-1.69	*
All nine indexes	-0.010		1.102	0.018		1.910	-0.028	-0.34	
TE =abs(netRet-indexRet)									
Barra Large Cap Growth	0.235	***	0.346	0.018	***	0.017	0.217	10.12	***
Barra Large Cap Value	0.186	***	0.324	0.017	***	0.009	0.169	7.66	***
Barra SmallCap Growth	0.357	***	0.597	0.029	***	0.038	0.327	5.85	***
Dow Jones Industrial	5.521	***	4.678	4.989	***	4.278	0.531	0.70	
Russell 2000	0.142	***	0.193	0.036	***	0.056	0.106	9.94	***
Standard & Poors Midcap 400	0.137	***	0.220	0.044	***	0.092	0.093	6.75	***
Standard & Poors Smallcap 600	0.132	***	0.182	0.018	***	0.018	0.114	12.39	***
Wilshire 5000	0.403	***	0.818	0.177	***	0.122	0.225	6.74	***
Standard & Poors 500	0.158	***	0.640	0.017	***	0.023	0.141	16.43	***
All nine indexes	0.268	***	1.069	0.460	***	1.854	-0.191	-2.43	**

Table 2.2. Continued

This table presents the descriptive statistics of effectiveness and tracking error of monthly net returns at the index level measured in percentage. Effectiveness is a difference between fund average net return across funds grouped by tracked index and return on the tracked index. Tracking error (TE) is an absolute value of the effectiveness measure. Corresponding statistics along with t-tests for the difference in means are provided for the sample of 171 conventional and 11 exchange traded index funds tracking nine indexes. The full sample contains 9,692 fund-month observations for the 2000-2004 period. The symbols *, ** and *** indicate statistical significance at less than 10-percent, 5-percent, and 1-percent levels, respectively.

Panel C	Conventional			ETF			Mean	$\mu_1 \neq \mu_2$	
Index	Mean	$\mu \neq 0$	Std. Dev.	Mean	$\mu \neq 0$	Std. Dev.	Difference	t stat	
Effectiveness: TE=(AveNetRet-IndexRet)									
Barra Large Cap Growth	-0.052		0.295	-0.016	***	0.019	-0.037	-0.96	
Barra Large Cap Value	-0.003		0.306	-0.015	***	0.013	0.012	0.30	
Barra SmallCap Growth	0.019		0.687	-0.020	***	0.044	0.038	0.43	
Dow Jones Industrial	0.000		6.851	0.258		6.607	-0.258	-0.2	
Russell 2000	-0.043	***	0.105	-0.024	***	0.062	-0.019	-1.21	
Standard & Poors Midcap 400	-0.007		0.128	-0.016		0.071	0.009	0.47	
Standard & Poors Smallcap 600	-0.051	***	0.129	-0.013	***	0.023	-0.038	-2.25	**
Wilshire 5000	0.133	***	0.389	0.106	***	0.189	0.027	0.47	
Standard & Poors 500	-0.022	*	0.098	-0.007	***	0.021	-0.015	-1.16	
All nine indexes	-0.003		2.288	0.024		2.097	-0.027	-0.19	
TE=abs(AveNetRet-IndexRet)									
Barra Large Cap Growth	0.182	***	0.237	0.018	***	0.017	0.164	5.33	***
Barra Large Cap Value	0.157	***	0.262	0.017	***	0.009	0.139	4.11	***
Barra SmallCap Growth	0.351	***	0.589	0.029	***	0.038	0.321	4.22	***
Dow Jones Industrial	5.245	***	4.354	4.989	***	4.278	0.256	0.31	
Russell 2000	0.079	***	0.080	0.036	***	0.056	0.043	3.41	***
Standard & Poors Midcap 400	0.086	***	0.094	0.043	***	0.059	0.043	2.97	***
Standard & Poors Smallcap 600	0.091	***	0.105	0.018	***	0.018	0.073	5.28	***
Wilshire 5000	0.314	***	0.262	0.177	***	0.122	0.137	3.54	***
Standard & Poors 500	0.075	***	0.067	0.015	***	0.016	0.059	6.70	***
All nine indexes	0.731	***	2.168	0.547	***	2.024	0.184	1.39	

Table 2.3. Descriptive statistics of ETFs and Conventional Index Funds Grouped by Index

This table presents the descriptive statistics of ETFs and institutional and retail conventional open-end index funds grouped by tracked index during the 2000-2004 period. For each variable, the mean is reported, and the standard deviation is given in parentheses. N is the number of fund-month observations, TNA is total net assets in millions of dollars, Exp is expense ratio (%), CapGain is capital gains distributions per share in dollars, and Flow is the net flow to a fund in millions of dollars.

	ETF					Institute					Retail				
Index	N	TNA	Exp	CapGain	Flow	N	TNA	Exp	CapGain	Flow	N	TNA	Exp	CapGain	Flow
Barra Large Cap	56	738.2	0.18	0.016	35.0	108	853.3	0.13	0.000	14.6	156	3471.0	1.34	0.000	-17.87
Growth		(601.8)	(0.00)	(0.040)	(36.5)		(159.8)	(0.03)	(0.000)	(39.0)		(4819.4)	(0.99)	(0.000)	(95.62)
Barra Large Cap	56	932.9	0.18	0.021	44.5	156	489.4	0.17	0.250	6.8	60	2978.4	0.22	0.391	-1.57
Value		(773.1)	(0.00)	(0.052)	(53.1)		(315.6)	(0.06)	(0.409)	(31.5)		(477.1)	(0.00)	(0.483)	(34.55)
Barra SmallCap	48	379.7	0.25	0.000	16.5	56	69.0	0.11	0.204	0.5	60	567.5	0.27	0.114	16.04
Growth		(277.2)	(0.00)	(0.000)	(47.1)		(40.4)	(0.01)	(0.276)	(15.4)		(348.3)	(0.01)	(0.230)	(22.01)
Dow Jones Industrial	48	4,861.6	0.18	0.000	92.4						144	108.3	2.40	0.101	-0.32
		(1,848.0)	(0.01)	(0.000)	(269.2)							(56.1)	(3.69)	(0.333)	(3.67)
Russell 2000	56	2,719.8	0.20	0.024	94.0	228	437.4	0.40	0.339	6.1	422	625.4	0.85	0.309	3.27
		(1,945.0)	(0.00)	(0.058)	(296.7)		(402.0)	(0.34)	(0.825)	(24.8)		(1,419.3)	(0.49)	(0.764)	(23.55)
S&P Midcap 400	104	3,008.5	0.23	0.023	39.7	182	545.4	0.32	0.399	14.5	266	794.5	0.55	0.480	16.38
		(2465.8)	(0.03)	(0.080)	(246.9)		(359.7)	(0.20)	(0.591)	(24.1)		(1,131.4)	(0.33)	(0.881)	(31.65)
S&P Smallcap 600	56	1,209.6	0.20	0.160	61.1	120	22.3	1.43	0.165	-0.04	300	307.1	0.69	0.391	2.68
		(960.6)	(0.00)	(0.397)	(155.1)		(15.8)	(2.89)	(0.286)	(2.9)		(253.6)	(0.53)	(0.566)	(7.22)
Wilshire 5000	44	1,842.4	0.15	0.000	82.2	308	2,358.9	0.15	0.007	47.53	564	2,719.8	0.52	0.047	27.84
		(1,074.4)	(0.00)	(0.000)	(120.3)		(2,705.2)	(0.08)	(0.028)	(111.7)		(6,028.7)	(0.41)	(0.134)	(118.58)
S&P 500	104	19,284.8	0.10	0.005	346.7	2,035	2,609.3	0.31	0.232	15.3	3,955	1,778.1	0.72	0.230	-1.26
		(16,557.0)	(0.01)	(0.019)	(1,577.9)		(5,667.0)	(0.21)	(1.220)	(132.3)		(9,643.0)	(0.49)	(1.102)	(181.64)
All indexes	572	5,183.2	0.18	0.027	108.8	3,193	2,006.3	0.33	0.218	16.4	5,927	1,672.6	0.75	0.229	2.56
		(9,859.4)	(0.05)	(0.138)	(702.1)		(4,698.8)	(0.64)	(1.019)	(112.5)		(8,177.7)	(0.81)	(0.959)	(154.30)

Table 2.4. Substitution Effect: Exchange Traded and Conventional Index Funds – Aggregate Flows

This table presents results from estimating the pooled OLS and SUR regressions of substitution effect between exchange traded and conventional index funds. The sample includes U.S. open-end index mutual funds and ETFs that track the same indexes over the 2000-2004 period. Tests were performed with aggregate figures for the sample of 418 index-months. The estimated coefficients are from the regression specification of the following equations:

$$FlowRF_{i,t} = \alpha_{i,t} + \beta_1 FlowETF_{i,t} + \beta_2 lagFlowRF_{i,t} + \beta_3 lagFlowETF_{i,t} + \beta_4 FlowIndustry_{i,t} + \beta_5 lagIndexRet_{i,t} + \beta_6 Ret_{i,t} + \beta_7 lagRet_{i,t} + \beta_8 Expenses_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t}$$

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowRF_{i,t} + \beta_2 lagFlowRF_{i,t} + \beta_3 lagFlowETF_{i,t} + \beta_4 FlowIndustry_{i,t} + \beta_5 lagIndexRet_{i,t} + \beta_6 Ret_{i,t} + \beta_7 lagRet_{i,t} + \beta_8 Expenses_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t}$$

where dependent variables are aggregated monthly flows to conventional index funds and to ETFs grouped by the index that the funds track. The independent variables include: lagged aggregate flows to both types of funds, industry flow, lagged index return, value weighted current and lagged funds returns, expenses, and log of aggregated by index TNA of conventional funds and ETFs. The regressions include index and year dummies. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-percent, 5-percent, and 1-percent levels, respectively. SUR reports system weighted R square.

	FlowRF						*FlowETF*					
	OLS		SUR		SUR		OLS		SUR		SUR	
Intercept	-182.50		-224.04		-804.72	***	700.30		672.15		142.40	
	(-0.37)		(-0.47)		(-6.27)		(0.33)		(0.33)		(0.38)	
FlowETF	-0.117	***	-0.215	***	-0.194	***						
	(-6.03)		(-11.56)		(-9.93)							
FlowRF							-0.712	***	-1.317	***	-1.063	***
							(-5.98)		(-11.51)		(-9.68)	
lagFlowRF	0.202	***	0.185	***	0.316	***	-0.009		0.126		0.293	***
	(4.43)		(4.05)		(7.15)		(-0.07)		(1.09)		(2.67)	
lagFlowETF	0.003		0.014		0.037	*	0.095	*	0.090	*	0.145	***
	(0.16)		(0.67)		(1.78)		(1.89)		(1.79)		(2.91)	
FlowIndustry	0.004	***	0.004	***	0.004	**	-0.002		0.001		-0.001	
	(3.25)		(2.77)		(2.51)		(-0.64)		(0.25)		(-0.32)	
lagIndexRet	-73.784		-167.795		-241.220		-900.967		-893.598		-953.05	
	(-0.10)		(-0.23)		(-0.32)		(-0.49)		(-0.49)		(-0.51)	
Ret	202.028		444.642		342.821		2,223.09	**	2,200.19	**	2,253.37	**
	(0.51)		(1.11)		(0.83)		(2.22)		(2.20)		(2.28)	
lagRet	196.021		277.043		174.329		734.353		834.165		696.29	
	(0.27)		(0.38)		(0.23)		(0.40)		(0.45)		(0.38)	
Expenses	19,779.9		16,786.6		27,973.9	***	-981,636		-888,591		-359,689	***
	(0.57)		(0.51)		(2.86)		(-0.86)		(-0.80)		(-3.18)	
logTNA	-1.450		13.478		92.172	***	148.295		126.053		111.563	***
	(-0.02)		(0.17)		(7.55)		(1.23)		(1.09)		(3.57)	
N of obs	418		418		418		418		418		418	
R-2	0.45		0.47		0.39		0.19		0.47		0.39	
Adj R-2	0.42						0.15					
Year Dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Index Dummies	Yes		Yes		No		Yes		Yes		No	

Table 2.5. Tax Clientele

This table presents results from estimating pooled OLS and SUR regressions of tax clientele between ETFs and conventional index funds. The sample includes U.S. open-end index mutual funds and ETFs that track the same indexes over the 2000-2004 period. Tests are performed with aggregate figures for the sample of 418 index-months. The estimated coefficients are from regression specification of the following equations:

$$FlowRF_{i,t} = \alpha_{i,t} + \beta_1 FlowETF_{i,t} + \beta_2 After{*}FlowETF_{i,t} + \beta_3 lagFlowRF_{i,t} + \beta_4 lagFlowETF_{i,t} + \beta_5 FlowIndustry_{i,t} + \beta_6 lagIndexRet_{i,t} + \beta_7 Ret_{i,t} + \beta_8 lagRet_{i,t} + \beta_9 Expenses_{i,t} + \beta_{10} LogTNA_{i,t} + \varepsilon_{i,t}$$

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowRF_{i,t} + \beta_2 After{*}FlowRF_{i,t} + \beta_3 lagFlowRF_{i,t} + \beta_4 lagFlowETF_{i,t} + \beta_5 FlowIndustry_{i,t} + \beta_6 lagIndexRet_{i,t} + \beta_7 Ret_{i,t} + \beta_8 lagRet_{i,t} + \beta_9 Expenses_{i,t} + \beta_{10} LogTNA_{i,t} + \varepsilon_{i,t}$$

where dependent variables are aggregated monthly flows to regular funds and to ETFs, grouped by the index that the funds track. The independent variables include: the interaction term of flows with dummy variable (*After*) indicating the change in capital gains taxes, lagged aggregate flows to both types of funds, flow to industry, lagged index return, value-weighted current and lagged funds returns, expenses, and log of aggregated by index TNA of regular funds and ETFs. The regressions include index and year dummies. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10, 5, and 1-percent levels, respectively. SUR reports system weighted R square.

Panel A	*FlowRF*						*FlowETF*					
	OLS		SUR		SUR		OLS		SUR		SUR	
Intercept	-160.3		-154.9		-745.6	***	765.7		786.9		173.3	
	(-0.33)		(-0.33)		(-5.94)		(0.37)		(0.40)		(0.47)	
FlowETF	-0.026		-0.127	***	-0.096	***						
	(-0.96)		(-4.88)		(-3.57)							
*After*FlowETF*	-0.174	***	-0.146	***	-0.167	***						
	(-4.74)		(-4.11)		(-4.50)							
FlowRF							-0.269	*	-0.874	***	-0.617	***
							(-1.83)		(-6.16)		(-4.36)	
*After*FlowRF*							-0.878	***	-0.731	***	-0.732	***
							(-4.88)		(-4.20)		(-4.15)	
lagFlowRF	0.214	***	0.197	***	0.324	***	-0.030		0.092		0.260	**
	(4.81)		(4.43)		(7.53)		(-0.27)		(0.81)		(2.42)	
lagFlowETF	-0.004		0.007		0.027		0.097	**	0.092	*	0.145	***
	(-0.18)		(0.34)		(1.32)		(1.97)		(1.87)		(2.98)	
FlowIndustry	0.004	***	0.004	***	0.004	***	-0.002		0.0004		-0.001	
	(3.40)		(2.96)		(2.68)		(-0.68)		(0.13)		(-0.39)	
lagIndexRet	-112.1		-189.7		-272.2		-644.5		-681.1		-739.0	
	(-0.16)		(-0.27)		(-0.37)		(-0.36)		(-0.38)		(-0.41)	
Ret	158.9		383.3		287.3		1831.6	*	1862.1	*	1846.2	*
	(0.41)		(0.98)		(0.71)		(1.87)		(1.91)		(1.91)	
lagRet	257.7		323.9		242.5		656.0		743.3		548.9	
	(0.36)		(0.45)		(0.33)		(0.36)		(0.41)		(0.30)	
Expenses	18,439.7		15,044.9		24,491.7	***	-736,042		-770,809		-371,454	***
	(0.55)		(0.46)		(2.56)		(-0.66)		(-0.71)		(-3.35)	
logTNA	-6.019		0.767		84.585	***	77.762		79.860		105.916	***
	(-0.08)		(0.01)		(7.05)		(0.66)		(0.70)		(3.46)	
N of obs	418		418		418		418		418		418	
R-2	0.48		0.48		0.40		0.23		0.48		0.40	
Adj R-2	0.45						0.19					
Year Dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Index Dummies	Yes		Yes		No		Yes		Yes		No	

Table 2.5. Tax Clientele, Continued

The estimated coefficients are from regression specification of the following equations:

$$FlowRF_{i,t} = \alpha_{i,t} + \beta_1 FlowETF_{i,t} + \beta_2 CapGainsRF_{i,t} + \beta_3 CapGainsETF_{i,t} + \beta_4 lagFlowETF_{i,t} + \beta_5 FlowIndustry_{i,t} + \beta_6 lagIndexRet_{i,t} + \beta_7 Ret_{i,t} + \beta_8 lagRet_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t}$$

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowRF_{i,t} + \beta_2 CapGainRF_{i,t} + \beta_3 CapGainsETF_{i,t} + \beta_4 lagFlowETF_{i,t} + \beta_5 FlowIndustry_{i,t} + \beta_6 lagIndexRet_{i,t} + \beta_7 Ret_{i,t} + \beta_8 lagRet_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t}$$

where dependent variables are aggregated monthly flows to regular funds and to ETFs, grouped by index that the funds track. The independent variables include: capital gains, lagged aggregate flows to both types of funds, flow to industry, lagged index return, value weighted current and lagged funds returns, expenses, and log of aggregated by index TNA of regular funds and ETFs. The regressions include index and year dummies. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-percent levels, 5-percent levels, and 1-percent levels, respectively. SUR reports system weighted R square.

Panel B	*FlowRF*						*FlowETF*					
	OLS		SUR		SUR		OLS		SUR		SUR	
Intercept	-124.3		-122.6		-714.8	***	-448.0		-424.5		-571.0	***
	(-0.17)		(-0.17)		(-4.65)		(-0.70)		(-0.67)		(-2.98)	
FlowETF	-0.129	***	-0.250	***	-0.200	***						
	(-3.44)		(-6.78)		(-5.35)							
FlowRF							-0.202	***	-0.396	***	-0.294	***
							(-3.41)		(-6.75)		(-5.17)	
CapGainsRF	-16.32	***	-16.84	***	-11.90	***	-5.18		-8.31		0.39	
	(-4.51)		(-4.66)		(-3.56)		(-1.02)		(-1.63)		(0.10)	
CapGainsETF	93.84		88.93		54.27		142.58		152.75		131.11	
	(0.40)		(0.38)		(0.24)		(0.42)		(0.45)		(0.45)	
lagFlowRF	0.047		0.041		0.102	**	-0.039		-0.029		0.021	
	(1.00)		(0.87)		(2.19)		(-0.67)		(-0.49)		(0.37)	
lagFlowETF	-0.003		0.012		0.034		0.118	***	0.114	**	0.149	***
	(-0.09)		(0.30)		(0.88)		(2.46)		(2.38)		(3.15)	
FlowIndustry	0.002		0.001		0.001		-0.005	*	-0.005		-0.005	
	(0.68)		(0.38)		(0.20)		(-1.63)		(-1.48)		(-1.50)	
lagIndexRet	336.39		238.75		176.52		-743.63		-657.99		-688.32	
	(0.24)		(0.17)		(0.12)		(-0.41)		(-0.37)		(-0.38)	
Ret	540.69		807.91		752.70		2,121.5	**	2,177.8	**	1,919.4	**
	(0.76)		(1.14)		(1.05)		(2.35)		(2.41)		(2.17)	
lagRet	926.45		1,006.3		1,015.4		779.67		946.80		623.76	
	(0.66)		(0.71)		(0.71)		(0.43)		(0.52)		(0.34)	
logTNA	23.55		27.03		99.81	***	80.57		76.93	*	114.63	***
	(0.17)		(0.20)		(5.70)		(0.97)		(0.94)		(4.23)	
N of obs	460		460		460		460		460		460	
R-2	0.18		0.21		0.16		0.13		0.21		0.16	
Adj R-2	0.14						0.09					
Year Dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Index Dummies	Yes		Yes		No		Yes		Yes		No	

Table 2.6. Institutional Clientele

This table presents results from estimating seemingly unrelated regressions of the clientele effect between institutional and retail conventional index funds and ETFs. The sample includes U.S. open-end index mutual funds and ETFs that track the same indexes over the 2000-2004 period. Tests were performed with aggregate figures for the sample of 371 institutional index-months and 418 retail index-months. The estimated coefficients are from the regression specification of the following equations:

$$FlowRF_{i,t} = \alpha_{i,t} + \beta_1 FlowETF_{i,t} + \beta_2 lagFlowRF_{i,t} + \beta_3 lagFlowETF_{i,t} + \beta_4 FlowIndustry_{i,t} + \beta_5 lagIndexRet_{i,t} + \beta_6 Ret_{i,t} + \beta_7 lagRet_{i,t} + \beta_8 Expenses_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t}$$

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowRF_{i,t} + \beta_2 lagFlowRF_{i,t} + \beta_3 lagFlowETF_{i,t} + \beta_4 FlowIndustry_{i,t} + \beta_5 lagIndexRet_{i,t} + \beta_6 Ret_{i,t} + \beta_7 lagRet_{i,t} + \beta_8 Expenses_{i,t} + \beta_9 LogTNA_{i,t} + \varepsilon_{i,t}$$

where dependent variables are aggregated monthly flows to institutional and retail index mutual funds and to ETFs, grouped by tracked index. The independent variables include: lagged aggregate flows to the types of funds, flow to industry, lagged index return, value-weighted current and lagged funds returns, expenses, and log of aggregated by index TNA of institutional or retail funds and ETFs. The regressions include index and year dummies. T-statistics are reported in parentheses. The symbols *, ** and *** indicate statistical significance at less than the 10-percent, 5-percent, and 1-percent levels, respectively. SUR reports system weighted R square. The F-test reports significance of difference in coefficients between groups.

Panel A	*FlowInst*		*FlowETF*		*FlowRetail*		*FlowETF*		F test	
	SUR		SUR		SUR		SUR			
	(1)		(2)		(3)		(4)		(1-3)	(2-4)
Intercept	61.801		2,663.73		122.571		-167.882			
	(0.20)		(1.23)		(0.41)		(-0.08)			
FlowETF	-0.108	***			-0.090	***				
	(-7.37)				(-7.20)					
FlowRF			-1.354	***			-1.354	***		
			(-7.53)				(-7.13)			
lagFlowRF	0.089	*	0.522	***	0.291	***	-0.351	*	***	***
	(1.67)		(2.82)		(6.54)		(-1.92)			
lagFlowETF	-0.003		0.123	**	0.016		0.080			
	(-0.17)		(2.30)		(1.27)		(1.61)			
FlowIndustry	0.002		-0.004		0.003	***	-0.002			
	(1.42)		(-0.97)		(3.05)		(-0.58)			
lagIndexRet	-497.062		4,384.86		-313.712		-1,027.64			
	(-0.16)		(0.07)		(-0.68)		(-0.56)			
Ret	-95.601		1,777.66		511.594	**	2,759.89	***		
	(-0.30)		(1.59)		(2.02)		(2.75)			
lagRet	651.201		-4,542.76		202.952		1,228.33			
	(0.21)		(-0.07)		(0.44)		(0.66)			
Expenses	21.043		-2,262,182		3,396.0		-205,261.0			
	(0.00)		(-1.57)		(0.16)		(-0.18)			
logTNA	24.916		179.692		-37.202		71.666			
	(0.81)		(1.36)		(-0.77)		(0.60)			
N of obs	371		371		418		418			
R-2	0.36		0.36		0.38		0.38			
Year Dummies	Yes		Yes		Yes		Yes			
Index Dummies	Yes		Yes		Yes		Yes			

Table 2.6. Institutional Clientele, Continued

This table presents results from OLS regressions of clientele effect between institutional and retail conventional index funds and ETFs. The sample includes U.S. open-end index mutual funds and ETFs that track the same indexes over the 2000-2004 period. Tests are performed with aggregate figures for the sample of 371 ETF index-months. The estimated coefficients are from regression specification of the following equation:

$$FlowETF_{i,t} = \alpha_{i,t} + \beta_1 FlowInst_{i,t} + \beta_2 FlowRetail_{i,t} + \beta_3 lagFlowInst_{i,t} + \beta_4 lagFlowRetail_{i,t} + \beta_5 lagFlowETF_{i,t} + \beta_6 FlowIndustry_{i,t} + \beta_7 lagIndexRet_{i,t} + \beta_8 Ret_{i,t} + \beta_9 lagRet_{i,t} + \beta_{10} Expenses_{i,t} + \beta_{11} LogTNA_{i,t} + \varepsilon_{i,t}$$

where the dependent variable is aggregated monthly to ETFs, grouped by index that the funds track. The independent variables include: aggregate flows to retail and institutional index funds, lagged aggregate flows to funds, flow to industry, lagged index return, value weighted current and lagged ETFs' return, expenses, and the log of aggregated by index TNA of ETFs. The regressions include index and year dummies. 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	*FlowETF*		*FlowETF*	
Intercept	237.903		-48.334	
	(0.11)		(-0.12)	
FlowRetail	-0.607	***	-0.527	***
	(-2.99)		(-2.72)	
FlowInst	-0.576	***	-0.487	***
	(-3.23)		(-2.86)	
lagFlowRetail	-0.662	***	-0.618	***
	(-3.43)		(-3.32)	
lagFlowInst	-0.610	***	0.712	***
	(3.38)		(4.16)	
lagFlowETF	0.098	*	0.113	**
	(1.87)		(2.21)	
IndustryFlow	-0.003		-0.004	
	(-0.85)		(-1.12)	
lagIndexRet	14,468		-30,243	
	(0.24)		(-0.55)	
Ret	2,293.21	**	2,291.91	**
	(2.13)		(2.19)	
lagRet	-14,002		30,765	
	(-0.23)		(0.56)	
Expenses	-133,700		-167,185	
	(-0.09)		(-1.34)	
logTNA	66.482		71.151	**
	(0.51)		(2.01)	
N of obs	371		371	
R-2	0.24		0.23	
Adj. R-2	0.19		0.20	
Year Dummies	Yes		Yes	
Index Dummies	Yes		No	

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AREAS OF INTEREST

- Research: Investments, Mutual Funds, Financial Institutions, Corporate Finance
- Teaching: Investments, Derivatives, Financial Institutions and Markets, Corporate Finance

EDUCATION

- Ph.D. in Finance, *Georgia State University*, USA, August 2007
- MA in Economics, *Georgia State University*, USA, 2001
- Diploma in Marketing**,** BA eq., Summa Cum Laude*, Karaganda State University*, Kazakhstan 1995

HONORS AND AWARDS

- Invited to the 2006 FMA European Doctoral Student Seminar
- Dissertation Grant, Georgia State University, 2006
- Nominated by the Dean of Business School and awarded the position of GSU Temporary Instructor in Finance, 2004 - 2005
- GSU Foundation Scholarship, 2002
- Soros Foundation Travel Grant, Almaty, Kazakhstan, Aug 1999
- Fellowship, Junior Faculty Development Program, USIA, Aug 1998
- Diploma with Honors, Karaganda State University, Jun 1995
- Scholarship for academic excellence, Karaganda State University, 1991 - 1995

DISSERTATION

- Two Essays on Mutual Funds

Committee: Jason Greene (Chair), Vikas Agarwal, Gerald Gay, and Conrad Ciccotello

Essay #1: "Cross-Sectional Differences among Money Market Mutual Funds and their Role in Mutual Fund Family."

Essay #2: "Innovations in Financial Products. Conventional Open-End Mutual Funds versus Exchange Traded Funds."

WORKING PAPERS

- *Cross-Sectional Differences among Money Market Mutual Funds and their Role in Mutual Fund Family* presented at 2006 European FMA Meeting Doctoral Student Seminar, Stockholm, 2006 FMA Annual Meeting, Salt Lake City, and Rotman School of Management Workshop on Advances in Portfolio Management, Toronto, Canada
- *Innovations in Financial Products. Conventional Open-End Mutual Funds versus Exchange Traded Funds* under review at *the Journal of Financial and Quantitative Analysis*, presented at 2007 EFA Annual Meeting, New Orleans, and 2007 FMA Annual Meeting, Orlando

WORK IN PROGRESS

- *Determinants of Fund Flows to ETFs and Conventional Index Funds*, with David Rakowski
- *Substitutability of Money Market Mutual Funds and Bank Accounts*

PARTICIPATION IN PROFESSIONAL MEETINGS

Presenter:

- 2007 FMA Annual Meeting, Orlando, October
- Rotman School of Management Workshop on Advances in Portfolio Management, Toronto, Canada, July 2007
- 2007 EFA Annual Meeting, New Orleans, April
- Finance Workshop, Georgia State University, October 2006
- 2006 FMA Annual Meeting, Salt Lake City
- 2006 European FMA Meeting Doctoral Student Seminar, Stockholm

Discussant:

- 2007 EFA Annual Meeting, New Orleans
- 2004 FMA Annual Meeting, New Orleans
- 2003 FMA Annual Meeting, Denver

Chair:

- 2007 EFA Annual Meeting, New Orleans

OTHER PROFESSIONAL ACTIVITIES

Ad-hoc reviewer Journal of Financial Research

TEACHING EXPERIENCE

- *Georgia State University*, Atlanta, Georgia, Fall 2003 – Fall 2006
  Instructor and Graduate Teaching Assistant (full responsibility in all courses)
  FI4200: Undergraduate Derivatives Markets, 2 sections
  FI3300: Undergraduate Core Corporate Finance, 7 sections
  FI3300H: Undergraduate Core Corporate Finance Honors, 1 Section
- Lecturer, *Karaganda Industrial University*, Kazakhstan, August 1995 – August 1999
  Undergraduate Core Course in Principles of Economics, 12 sections
- Teacher, *Temirtau Lyceum*, Kazakhstan, January 1998 – June 1998
  Principles of Economics for grades 8-11

NON-REFEREED PUBLICATIONS

- Agapova A. (1997) "Marketing in a System of Strategic Management." In collection of scientific articles: *The Problems of Theory and Practice of Transition to Market Economy*. Karaganda, publishing house of Karaganda State University.
- Agapova A. (1997) "The Ways of Intensification of Innovation Process in an Enterprise." In collection of scientific articles*: The Vital Problems of Reformation of Kazakhstan Economy*. Karaganda, publishing house of Karaganda State University.
- Agapova A. (1997) "Management of Innovations in Market Economy Conditions." In collection of scientific articles: *The Theory and Practice of Management:*

Domestic and Foreign Experience. Karaganda, publishing house of Karaganda State University.
- Agapova A. (1997) "Market Tendency for Innovation Activities." In collection of scientific articles: *The Theory and Practice of Management: Domestic and Foreign Experience*. Karaganda, publishing house of Karaganda State University.
- Agapova A. (1997) "Regional Aspects of Domestic and Foreign Experience in Innovative Entrepreneurship." In collection of scientific articles of post-graduate students: *Natural Sciences.*

RESEARCH EXPERIENCE

Graduate Research Assistant*, Georgia State University*
- Robinson College of Business, Department of Finance: assisted Professors Garner, Pouget, Kale, and Smith, Fall 2001 - Fall 2003, and Professor Gay, Fall 2005
  - Developed SAS programs and ran simulations for a market microstructure study
  - Created database of companies' derivatives use from their 10k filings
- Andrew Young School of Policy Studies, Department of Economics: assisted professors Mudd and Scafidi and the International Studies Program (ISP), Fall 1999-Summer 2001
  - Worked on setting up and analyzing a research database on international trade activity in Georgia
  - Assisted in fiscal project for developing countries of former Soviet Union, co-operative work of ISP and the International Monetary Fund (IMF); Constructed database for evaluating government structures of the countries.
  - Worked on research in urban studies

CORPORATE EXPERIENCE
- Accountant and Economist, *Eurasia*, Kazakhstan, October 1995 – September 1997
  - Created monthly expense and revenue reports and conducted market analysis. Maintained and monitored 50 client accounts.
- Intern, *Karaganda Metallurgical Plant* (currently *Mittal Steel Temirtau*), Kazakhstan, June – July 1994 and January – March 1995
  - Assisted in marketing research

ADDITIONAL TRAINING
- Department of Management, The University of Tennessee, Knoxville, Aug 1998 - May 1999. Visiting Scholar, Certificate
- Summer School of Economics, Professional Training Program by the International Higher Education Support Program (IHESP) of the Open Society Institute and KIMEP, Almaty, Kazakhstan, Jul - Aug 1998. Course in Advanced Microeconomics, Certificate
- Workshop "Japanese Management – New Methods of Operation", Kazakhstan State Academy of Management, Almaty, Kazakhstan, Aug 1997