Do regulated mutual fund fees affect competition, fund flows and performance? Evidence from U.S. equity funds

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Abstract

We investigate mutual fund fee setting in U.S. equity funds from 1992 to 2008, following the Securities and Exchange Commission's (SEC) approval of a one percent ceiling on 12b-1 fees from 7th July 1993. Empirical research on the efficacy of mutual fund fee caps is scarce despite consumer protection advocacy for ceilings. We present evidence of substitution effect between 12b-1 fee and loads only in a competitive environment. Proximity to the regulated cap is associated with higher discretionary fees (expense-shifting hypothesis), lower fund performance and higher money outflows. The evidence has potential policy implications concerning the *raison d'être* for price ceilings in financial services industry.

JEL classification: G23, L10, L11

Keywords: Mutual funds, price ceilings, expense shifting, 12B-1 fees

1. Introduction

Should mutual fund fees be regulated? This is an issue of perennial interest to financial economists, practitioners and regulators. In the U.S. mutual fund industry, the debate on the appropriateness of fund fees has raged since the 1950s. Recently, prominent personalities such as John C. Bogle, founder of the Vanguard Group and Eliot Spitzer, former Attorney General and Governor of New York, have spoken against their perceived excesses.[1] In addition, Mary Schapiro, the newly appointed SEC Chairwoman since January 2009 has voice her concerns on 12b-1 fees in her recent speech:

"Investors may have no idea these fees are being deducted, what services they are paying for, or who they are ultimately compensating. Increasingly, 12b-1 fees have become revenue substitutes for the growing number of funds that don't charge "loads" or sales fee".[2]

All of these criticisms suggest that 12b-1 fees are no longer used for its intended purposes, which are to attract new shareholders into funds through advertising and provide incentives for brokers to market the funds. This is supported by previous literature which concludes 12b-1 fees as dead-weight costs.[3] Furthermore, there are also market concerns and suspicions that 12b-1 fees are being siphoned for other fees as investors appear to pay more attention on "salient in-your-face fees" such as loads as oppose to other fees.[4] Such criticisms are often accompanied by calls for greater fee regulation (Coates and Hubbard 2007). This study investigates the consequences of fee regulation in the U.S. mutual fund industry, a market where

[1] See Coates and Hubbard (2007) for a comprehensive summary of the fee debate in the U.S.
[2] "Mutual fund 12b-1 fees could get a makeover?", New Haven Register, March 22, 2010.
[3] See Ferris and Chance (1987, 1991), Freeman and Brown (2001), Dukes et al (2006), Bergstresser, Chalmers, and Tufano (2009), among others.
[4] See Wilcox (2003) and Barber, Odean and Zheng (2005).

some fee structures are regulated through the capping of distribution or marketing fee (12b-1) and aggregate sales charges.[5]

In this paper, due to increasing controversies and criticisms on the existence of 12b-1 fees, we examine the determinants of 12b-1 fees and the fee-setting strategies of U.S. fund managers in relation to regulated fees. We focus on two plausible explanations for fund managers to exploit fund fees. First, following Barber, Odean and Zheng (2005) paper, we argue that investors are generally influenced by salient and attention grabbing information like loads and being less mindful for operating expenses. While operating expenses constitutes a steady drain of fund's performance, its effects appeared to be masked by considerable volatility in the returns on equity funds. Our main hypothesis is that fund managers are taking advantage of 12b-1 fee since the introduction of 1% fee ceiling in 1993 as most investors are largely unaware of its significance in reducing funds' performance.[6] This view would be supported by findings that U.S. equity load and no-load funds gradually increased their 12b-1 fees towards the ceilings after 1993 when the caps were introduced.[7]

Second, utilizing the expense-shifting hypothesis as proposed by Siggelkow (1999, 2004), Koppenhaver and Sapp (2005) and Edelen, Evans and Kadlec (2008), we argue that fund managers could simply recoup their fee income in alternative fund charges at their discretion

[5] Marketing/12b-1 fees are defined by the Securities Exchange Commission (SEC) as "fees paid by the fund out of fund assets to cover distribution expenses and sometimes shareholder service expenses". The fee setting of 12b-1 and aggregate sales charges by fund managers should be similar as both are subject to regulated fee caps. However, the main focus of this study is on the 12b-1 fee which is capped at 75 basis points per year, with an additional 25 basis point of annual service fee. We do not include aggregate sales charges (front-end and back-end loads) which are capped at 7.5% (for funds that charge 12b-1 fees) and 8.5% (for funds that do not charge 12b-1 fees) in our analysis as they vary depending on initial investment amount and holding period, variables that are unobservable to us.

[6] From 1962 to 1999, Barber, Odean and Zheng (2005) present evidence that there have been an increasing trend for operating expenses while a declining in proportion of funds charging load fees. The authors point out to one possibility that mutual fund managers have figured out that investors are sensitive to load fees, but less so to operating expenses.

[7] In this paper, we classified load funds as funds that charge either front or rear-end loads while no-load funds as funds that do not charge any loads. It is important to note that the new regulation prohibits funds with front-end, deferred, and/or 12b-1 fees in excess of 0.25% from being called "no-load".

without the awareness of the investors. In addition to 12b-1 fees as our main focus, we also hypothesized higher discretionary fees charged by funds for two reasons. On one hand, they may seek to attract more funds by charging 12b-1 fees below the regulated caps and subsequently charging higher discretionary fees to recoup their costs (analogous to the use of lending practice used by banks to attract new payday borrowers at low prices and then subsequently charge high prices on repeated borrowings in Petersen and Rajan 1994). On the other hand, if regulators set fee ceilings below competitive equilibrium levels, this may force fund managers to increase discretionary fees. This would suggest that fund managers use higher discretionary fees to compensate for the ceilings placed on their 12b-1 fee income.

The main contribution of this paper is to examine for the first time in the mutual funds literature, the effectiveness of regulated ceilings on mutual fund fees. Price ceilings are used in various economic settings to protect consumers from exploitation by suppliers. Regulators often argue that price ceilings are not detrimental to competition if they are non-binding. In other words, competition can exist below the ceilings in line with competitive equilibrium prices. The theory of focal points (Scherer and Ross, 1990), however, offers a counter argument that price ceilings instead weaken competition by encouraging "collusion" to cluster prices around fee ceilings. While collusion could potentially be one aspect that deprives investors of higher fund performance, another strand of literature argue that investors are generally unaware of what they are being charged by fund managers, in particular, the "hidden" or discretionary fees.[8] To the best of our knowledge, price ceilings in the mutual fund industry have yet to be studied. We examine whether the introduction of Rule 12b-1 plan, in particular the fee ceiling of 1% in 1993 do improve the general welfare of the investors.

[8] See, for example, Siggelkow (1999, 2004), Wilcox (2003), Barber, Odean and Zheng (2005), and Edelen, Evans and Kadlec (2008).

The mutual fund industry setting allows us to make a unique contribution to the literature on price ceilings by examining the coexistence of capped fees with other fees charged at the fund managers' discretion. Generally the literature focuses on a single price. In mutual funds, regulated marketing expenses are only part of the total price. Discretionary fees such as operating expenses, management, non 12b-1, information disclosure, and administrative fees are non-trivial.[9] We investigate the link between the setting of the 12b-1 fees relative to regulated ceilings and the level of discretionary fees using a double-hurdle model.

Finally, we examine the impact of ceilings on fund performance and money flows. Numerous papers have looked at the relationship between mutual fund performance and fund flows and the roles of fees in the correlation, but none of these studies has considered the impact of regulated mutual fund.[10] We use a propensity score matching algorithm to identify a control sample of equity funds against which we compare funds charging fees at the ceiling.

Our findings may be summarized as follows. First, we show evidence in support of Barber, Odean and Zheng (2005) that investors are being exploited by fund managers through 12b-1 fee by load (from 1993 to 2003) and no-load funds (from 1999 to 2008). By focusing on the second half of our sample period solely, we observe substitution effects between loads and 12b-1 fees for both load and no-load funds. This suggests competitive environment as documented by Wahal and Wang (2010) in U.S. mutual fund industry appear to benefit investors through lower fees. Second, we find that larger and older funds are less likely to charge 12b-1 fees at the ceiling. Third, we find no evidence of substitution between 12b-1 fee and both management and non 12b-1 fees with the exception of 12b-1 and non 12b-1 fee for load funds

[9] In this paper, consistent with the previous literature, we classified non-marketing fees as non 12b-1 fees which are calculated by subtracting 12b-1 fees from expense ratio (Barber, Odean and Zheng (2005)).
[10] See, for example, Ippolito (1992), Gruber (1996), Carhart (1997), Goetzmann and Peles (1997), Sirri and Tufano (1998), and Lynch and Musto (2003).

sample. Hence, in general, fund managers appear to use 12b-1 fees to shift marketing and distribution expenses onto current shareholders through higher management and non 12b-1 fees. Fourth, using a double hurdle model as robustness test, we find that fund size (turnover ratio) is negatively (positively) correlated with management and non 12b-1 fees when funds that charge them set regulated 12b-1 fees at the ceiling. Hence, our overall results are in support of economies of scale attained by larger funds while high turnover ratios are associated with higher discretionary fees such as management and non 12b-1 fees. Finally, we find that equity funds that charge 12b-1 fees at the ceiling underperform and suffer negative fund flows as compared to those funds that set below the ceiling.

The results of this study have policy implications and are of relevance to investors and academic researchers. First, our findings inform policymakers on how fund managers behave in setting fees when facing regulation, and guide them on the appropriateness of introducing regulated ceilings to other fees.[11] Second, the findings are also relevant to investors who are particularly sensitive to "salient in-your-face fees" such as loads, while being less mindful of other fees, even though both types of fees lower overall performance.[12] Finally, we contribute to the growing literature on competition in the mutual fund industry. Papers such as Hortascu and Syverson (2004) and Wahal and Wang (2010) investigate fund fee heterogeneity from the perspective of product differentiation. Elton, Gruber and Busse (2004) examine the role of investor irrationality in influencing fund managers' fee setting behavior. None of these studies considers regulated fees.

[11] Apart from the ceiling on 12b-1 fees studied in this paper, a fee cap already exists for sales related charges. Regulated fees could be extended to other discretionary fees if policymakers find such regulation effective in promoting fair competition and protecting investors' interests.
[12] See Wilcox (2003) and Barber, Odean and Zheng (2005).

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature in relation to the substitution effect and expense shifting hypothesis. Section 3 provides a background of the U.S. mutual fund industry and fee structures. Section 4 describes the data. Section 5 explains the research methodology. The empirical results for our paper and robustness tests are presented in Section 6. Section 7 discusses the policy and practical implication and section 8 concludes the paper.

2. Literature Review

2.1 Substitution Effect and Expense-Shifting Hypothesis

The principal-agent problem has found considerable attention in both empirical and theoretical literature on the economics of organizations since the seminal paper by Jensen and Meckling (1976).[13] From mutual fund industry perspective, agency problems arise within a fund whenever fund managers (agents) have incentives to pursue their own interests at investor expense (principal), in particular, how fund managers manage 12b-1 fee entrust by investors in anticipation for higher returns as a result of economies of scale. Many studies found contrary evidence that 12b-1 fee appears to be dead-weight costs and more recently, Bergstresser, Chalmers, and Tufano (2009) found that there is limited evidence that investors benefit from professional brokerage services.

In the U.S. mutual fund industry, Siggelkow (1999, 2004) presents evidence on the resilience of agency problems despite several factors which should curb opportunistic behavior

[13] Jensen and Meckling (1976) define an agency relationship "as contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent."

through strong observation that agents surreptitiously shift their expenses.[14] A more recent study by Edelen, Evans and Kadlec (2008) document similar finding that expense shifting occurs with relatively controversial distribution expenses, and these payments exhibit the most severe performance degradation (agency costs). However, none of these studies considered the impact of regulated fund fees on fund manager' behavior in shifting fund expenses to unregulated or discretionary fees.

3. Background to Mutual Fund Fee Structures

According to the Investment Company Institute (ICI), in 2010 the U.S. mutual fund market, with $11.1 trillion in assets under management as of year-end 2009, remained the largest in the world, accounting for 48 percent of the $23 trillion in mutual fund assets worldwide. Despite the tremendous growth of the industry, mutual fund fees have been subjected to increased scrutiny over the past few years with allegations that fund management fees are too high (see, for example, Freeman and Brown (2001)). More recently, Bogle (2005) demonstrates that the average cost of owning mutual funds has risen over 100 percent in the last sixty years. This controversy has focused the attention of the Securities Exchange Commission (SEC) on the detrimental impact of fees on investor's returns in the U.S. mutual fund industry.[15]

Mutual fund fees are generally classified into two main categories: loads and annual operating expenses. There are two types of loads: front-end (when shares are purchased) and back-end or rear-end (when shares are redeemed) loads. Annual operating expenses, on the other hand, include management fees, distribution or marketing fees (12b-1), administrative fees and

[14] These factors include redemption at relatively little cost, monitoring by investors due to substantial amounts of their wealth, highly competitive industry, important role of trust and reputation for mutual fund providers, and performance measure information is readily available to investors.
[15] See, for example, "S.E.C. Pushes to Reform Mutual Fund Fees", *New York Times*, 4 December 2009.

other operating expenses. It is important to note that loads are charged once-off and operating expenses annually.

There has been a growing literature on 12b-1 plans in the mutual fund industry, in light of past allegations on 12b-1 fees being dead-weight costs.[16] The 12b-1 plans allow mutual funds to reach into their funds' assets to pay for the distribution of the funds' shares. These so-called distribution or marketing payments had been prohibited for 40 years until on 7th July 1993, the SEC approved changes in the National Association of Security Dealers' rules governing investment company sales charges. These changes place an annual cap on 12b-1 fees of 75 basis points with an additional annual service fee of 25 basis points, hence a combined 12b-1 fee of 1 percent. The innovation of this study to focus on load and no-load funds is that both subsamples are subjected to fee ceiling of 1% and 0.25% respectively which allow us to empirically examine the fee setting strategy of U.S. fund managers.

The original justification of the plan, as put forth by the mutual fund industry in the 1970s, was that such fees attract new shareholders into funds through advertising and provide incentives for brokers to market the funds. The proponents of the 12b-1 plan argue that the increase in the stability and size of funds as a result of the marketing efforts funded by 12b-1 fees would benefit shareholders through the lowering of expense ratios over time as a result of economies of scale. The implementation of a 12b-1 plan potentially leads to a steady inflow of cash. Reducing the volatility of fund deposits and redemption flows enables funds to hold less cash to meet redemptions and invest a larger percentage of assets into higher yielding securities.

A counter argument is that there is no evidence that 12b-1 fees are successful at growing funds or that shareholders benefit. Opponents of the plan argue that there is a conflict of interest from allowing fund advisers to use fund assets to pay for attracting new investors, since fund

[16] See Ferris and Chance (1987, 1991), Freeman and Brown (2001), Dukes et al (2006), among others.

advisers earn fees based on assets under management. Despite the usage of the 12b-1 fee to pay for a wide array of services, the main point of contention is its usage in compensating brokers which goes beyond its original intended use as a marketing and distribution fee. The debate over the 12b-1 plan stems from a lack of clear evidence demonstrating that shareholders actually obtain benefits from the hypothesized asset growth and reduced flow volatility.

Despite the capped 12b-1 fees, discretionary fees such as the management and non-marketing related fees to cover information disclosure, interest, accounting, legal, and administrative expenses are non-trivial and vary across funds.

4. Sample Construction and Description of Key Variables

4.1 Data and variables

The main source of data for this study is the Center for Research in Security Prices' (CRSP) Mutual Fund Database. From this database, we collect fund characteristics including fund size, age, net asset value, turnover, cash ratio, investment objective, institutional/ retail fund indicator, market (S&P500) adjusted returns and fees (expense ratio, management and 12b-1 fees, and front and rear end loads.). The sample period is from 1992 through 2008, the starting date being the commencement of the database. All of our variables are winsorized at top and bottom one percent to eliminate any potential outliers.

This study focuses on the 21,658 open-end, actively managed, diversified domestic equity funds in the database over our sample period. We choose equity funds to achieve a homogenous sample. Other studies on mutual fund size and expense ratios (Ferris and Chance (1987), Malhotra and McLeod (1997), LaPlante (2001)) have typically included other fund varieties (including bond and money market funds). In our context, a homogenous sample is

desirable for ease of interpretation of results since there is typically little variation in fees across fixed income type funds.

In summary, the main variables constructed from the data are as follows:

SIZE: Fund net asset value at the end of the period,

AGE: Number of years since the fund's inception,

NAV: Fund net asset value (total net assets divided by the number of shares outstanding) for each year,

TURNOVER: Level of turnover (minimum aggregate of sales or purchase of securities divided by the average total net assets) for the fund during each year,

CASHRATIO: Amount of cash holdings for the fund at the end of each quarter, in percentage terms, of fund assets,

GROWTH: A binary variable that equals one if the fund uses an aggressive growth investment strategy, and zero otherwise,

GROWTHTNA: Growth in net assets over the prior period,

HERFINDAHL: Measure of industry concentration, calculated by summing the squared market shares of Top 100 largest fund family in U.S. mutual fund industry on quarterly basis,

MAR: Fund market (S&P500 Index) adjusted return,

FUNDCOMPLEX: A variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise,

12B-1CEILING: A binary variable that equals 1 if the fund charged 12b-1 fees at ceiling (1% for load funds and 0.25% for no-load funds) and 0 otherwise, and

12B-1GAP: The difference between the 12b-1 fee ceiling and the actual 12b-1 fee charged by load and no-load funds expressed in percentage terms.

The previous literature suggests that fund size and age could potentially be non-linearly related to the total expense ratio which requires a log transformation for both variables to account for the non-linear relationship.[17]

To start, we perform a correlation matrix analysis to identify any correlated variables that might bias the final results. In Table 1, all of the independent variables appear to have low correlations with each other suggesting multicollinearity is likely not a problem for our analyses.

< Insert Table 1 here >

Table 2 reports descriptive statistics on all the variables used in this study. The average expense ratio (1.47%), management fee (0.49%), 12b-1 fee (0.59%) and non 12b-1 fee (1.11%) are largely consistent with the previous literature. Following Barber, Odean and Zheng (2005), we compute the non 12b-1 fee component by subtracting 12b-1 fees from the expense ratio. By looking at the 12B-1CEILING variable, 38.4% of all load funds in our sample charge 12b-1 fees at the ceiling as compared to 29.2% of no-load funds charging at the ceiling.

< Insert Table 2 here >

Table 3 reports the average (mean) of all variables when the 21,658 sample equity funds are sorted into three groups (terciles) by total net asset value over the sample period (1992 to 2008). This data rearrangement yields several preliminary insights. The expense ratio is the highest for the bottom one third of the sample at 1.69% while the top one third stands at 1.20%. This result also applies to 12b-1 and non 12b-1 fees which suggests some potential for economies of scale and suggests the intent behind the regulation of the fund fees is producing desired results. However, the management fee is higher for larger equity funds at 0.66% as

[17] See Tufano and Sevick (1997), Malhotra and McLeod (1997), Geranio and Zanotti (2005), among others.

compared to 0.09% for the smaller ones. The 12B-1GAP variable demonstrates that the larger load and no-load funds charge 12b-1 fees below the ceiling. We subject these preliminary findings to more rigorous econometric examination below.

< *Insert Table 3 here* >

To provide a perspective on funds' proximity to fee caps, the number of equity funds charging 12b-1 fees at or below the ceiling for both load and no-load funds is presented in Table 4. Over the sample period, there is an increase in the number of equity funds charging 12b-1 fees at the ceiling from 10.00% to 28.82% for load funds and from 6.96% to 50.29% for no-load funds. Interestingly, in the second half of our sample period, we observe a relatively smooth trend which could be attributed to increasing level of competition amongst U.S. mutual funds as documented by Wahal and Wang (2010).

< *Insert Table 4 here* >

As a preliminary univariate analysis, this study compares the characteristics of load and no-load funds charging 12b-1 fees at and below the ceiling, respectively. As shown in Table 5, funds that charge 12b-1 fees at the cap are generally smaller. The turnover level is observed to be higher for funds that charge 12b-1 fees at the ceiling with 95.5% for load funds and 99.8% for no-load funds, with the finding significant at the 1% level. In terms of mutual fund fees, funds that charge at the ceiling also charge higher expense ratios (2.13% for load and 1.35% for no-load funds) and management fees (0.53% for load and 0.67% for no-load funds). We subject this preliminary evidence of cross-subsidization between 12b-1 fees and other fund expenses to greater scrutiny below.

< Insert Table 5 here >

5. Methods

5.1 Impact of Ceilings on Regulated Fund Charges and Substitution Effect

To answer the research question of whether fund managers persistently increase 12b-1 fee towards the ceiling over our sample period, we use dependent variable 12B-1GAP, which is defined as the difference between the 12b-1 fee ceiling and the actual 12b-1 charged by funds expressed in percentage terms. The main regression specification is:

$$12B\text{-}1GAP_{i,t} = \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 AGE_{i,t} + \beta_3 NAV_{i,t} + \beta_4 TURNOVER_{i,t} + \beta_5 CASHRATIO_{i,t} + \beta_6 GROWTH_{i,t} + \beta_7 GROWTHTNA_{i,t} + \beta_8 HERFINDAHL_{i,t} + \beta_9 MAR_{i,t} + \beta_{10} FUNDCOMPLEX_{i,t} + \beta_{11} TIME\ DUMMIES_{i,t} + \varepsilon_{i,t} \quad (1)$$

In equation (1), the regressors are as described in Section 4.1 above, and are hypothesized to be related to fee-setting in line with the literature (see, for example, LaPlante (2001), Geranio and Zanotti (2005), Dukes et al. (2006)). In addition to commonly found determinants of fund fees, we include the GROWTH variable to distinguish between the growth investment objective and other investment strategies. CASHRATIO is added as an indicator of fund's efficiency and the Herfindahl index variable is incorporated to control for industry competition.

We focus specifically on the yearly time dummy variables as indicators of fee setting activities. If the regulated ceiling on 12b-1 fees provides a platform for fund managers to move 12b-1 fee towards the ceiling without breaching competition law over time, this will support our main hypothesis conjectured in earlier section.[18] We would observe a declining 12B-1GAP over time as funds observe and react to mutual fund investors' behavior relative to the ceiling.

[18] We use yearly instead of half-yearly and quarterly time dummies due to the timing (once a year) of mutual fund fee reporting.

Alternative explanation would be the substitution effect between 12b-1 and load fees by running the above regression focusing on sub-sample of load and no-load funds. We will find evidence in support of our alternate conjecture should load (no-load) funds observed to charge lower (higher) 12b-1 fee over our sample period. In our further test, we further examine the substitution effect by regressing management and non 12b-1 fee on our variable of interest, 12B1 RATIO as shown in equation (2) and the regressors are as described in Section 4.1 above.

$$MANFEE/NON12B1_{i,t} = \beta_0 + \beta_1 12B1\ RATIO_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 AGE_{i,t} + \beta_4 NAV_{i,t} + \beta_5 TURNOVER_{i,t} + \beta_6 CASHRATIO_{i,t} + \beta_7 GROWTH_{i,t} + \beta_8 GROWTHTNA_{i,t} + \beta_9 HERFINDAHL_{i,t} + \beta_{10} MAR_{i,t} + \beta_{11} FUNDCOMPLEX_{i,t} + \varepsilon_{i,t} \quad (2)$$

5.2 Impact of Ceilings on Discretionary Fees

Fee setting in the U.S. mutual fund industry involves two considerations: (1) whether to set 12b-1 fees at the ceiling (denoted here as the participation decision) and (2) how much to charge for discretionary fees (fee setting decision). In this context, we can adopt the double hurdle model, proposed by Cragg (1971), who models the probability of a goods purchase decision as independent of the expenditure decision. This model has been used in recent studies to accommodate the restrictions of using Tobit model.[19] Specifically, we adapt the double hurdle model to determine whether funds that charge 12b-1 fees at the ceiling also charge higher levels of discretionary fees by performing probit and truncated regression analyses simultaneously.

Abstracting from the benchmark model using the double-hurdle model framework of Cragg (1971), our specifications are shown in equations (3) and (4):

[19] See Moffatt (2005) (on loan defaults), and Aristei and Pieroni (2008) (on consumption decisions), among others.

Participation equation:

$$P_i = X_{pi}\beta_p + \varepsilon_{pi} \qquad \varepsilon_{pi} \sim n.i.d.(0, \sigma_p^2) \tag{3}$$

Fee setting equation:

$$F_i = X_{fi}\beta_f + \varepsilon_{fi} \qquad \varepsilon_{fi} \sim n.i.d.(0, \sigma_f^2) \tag{4}$$

In the participation equation, X_{pi} is a vector of factors explaining variation in the participation decision for i =1, …, N total observations. β_p is a vector of unknown parameters relating X_{pi} to P_i and ε_{pi} is the error term.

In the fee setting equation, X_{fi} is a vector of factors explaining variation in the fee setting decision for i =1, …,N_i, where N_i is the number of funds which set 12b-1 fees at the ceiling. β_f is a vector of unknown parameters relating X_{fi} to F_i and ε_{fi} is the error term. It is assumed that ε_{pi} and ε_{fi} are normally independently distributed and that each has a zero mean.

To analyze the factors that influence the decision to set 12b-1 fees at the ceiling, the following probit model is specified:

$$\begin{aligned} 12B\text{-}1CEILING_{i,t} = {} & \beta_0 + \beta_1 SIZE_{i,t} + \beta_2 AGE_{i,t} + \beta_3 NAV_{i,t} + \beta_4 TURNOVER_{i,t} \\ & + \beta_5 CASHRATIO_{i,t} + \beta_6 GROWTH_{i,t} + \beta_7 GROWTHTNA_{i,t} \\ & + \beta_8 HERFINDAHL_{i,t} + \beta_9 MAR_{i,t} + \beta_{10} FUNDCOMPLEX_{i,t} + U_{i,t} \end{aligned} \tag{5}$$

where $12B\text{-}1CEILING_{i,t}$ is a binary variable with a value of one if the fund sets 12b-1 fees at the ceiling and zero otherwise. This participation dependent variable is expressed as a probability. Other regressors are as explained in Section 4.1.

Consistent with previous literature, we use a probit model to examine the probability of funds charging 12b-1 fees at the ceiling as the first hurdle. As for the second hurdle, $MANFEE_{i,t}$

and $NON12B1_{i,t}$ replace $12B\text{-}1CEILING_{i,t}$, where both $MANFEE_{i,t}$ and $NON12B1_{i,t}$ are management and non 12b-1 fees, respectively (i.e., fee setting dependent variable), and $\varepsilon_{i,t}$ takes the place of $U_{i,t}$ as the error term. A truncated regression model is used in the second hurdle as it is the intention of the double hurdle model to exclude funds that charge 12b-1 fees below the ceiling by applying a threshold on 12B-1CEILING equal to one. Therefore, those funds that charge below the ceiling are excluded. This allows us to examine the specific issue of whether funds that charge 12b-1 fees at the ceiling also charge higher discretionary fees.

We expect that setting 12b-1 fees at the ceiling would be statistically significant in predicting higher levels of discretionary fees. The inference of this hypothesis is that the fee caps are considered by fund managers as being too low relative to their operating costs and profit objectives. Such fund managers charge 12b-1 fees at the ceiling and high discretionary fees as compensation.

5.3 Impact of Ceilings on the Performance and Fund Flow

In the next stage of our analysis, we examine the economic impact of fee ceilings by comparing the performance and money flows of funds that charge 12b-1 fees at the ceiling to those that do not. To create a control group of funds that do not charge 12b-1 fees at the ceiling, we use a propensity score algorithm (see Hillion and Vermaelen (2004) and Cooper et. al (2005)). Propensity score matching algorithms are becoming increasingly popular in constructing suitable control groups in nonexperimental studies as no constraints are imposed on the matching variables, accommodating a large number of matching variables and producing accurate estimates of the treatment impact despite limited comparable units.

The propensity score method involves the following steps:

(1) Estimate and compute propensity score using a logistic regression model for each fund by denoting the dependent variable as a binary variable that takes the value of 1 for funds that charge 12b-1 fees at the ceiling, and 0, otherwise as follows:

$$P_{i,j} = PROB\left(\left(D_{i,j} = 1 \middle| X_{i,j,l}\right)\right), \quad \text{for } i = 1,\ldots, N_j. \tag{6}$$

In the first step, the independent variables control for determinants of fund flows and performance motivated from previous studies as explained below.

(2) Separate treatment and control groups (funds that charge at the cap versus those that charge below), and sort observations within each group from lowest to highest propensity scores.[20]

(3) Match treatment and control funds based on the closest propensity score (kernel matching method).

(4) Repeat steps 1-3 every year from 1992 through 2008.

(5) Pool the estimated propensity scores across the years (1992 to 2008) and obtain a total sample of treatment and control funds.

The previous literature has shown that the performance-flow relationship is nonlinear in that investors generally direct their investments to funds that performed very well in the recent past but fail to withdraw their investments from funds that performed poorly (Ippolito (1992), Gruber (1996), Carhart (1997), Goetzmann and Peles (1997), Sirri and Tufano (1998), and Lynch and Musto (2003). In addition, minimization of search costs is an important consideration for investors. Search costs are closely linked to the size of the fund complex as well as the current media attention received by the fund (Sirri and Tufano (1998)). Our key control variables

[20] Hereafter, we use "Treatment Funds" to refer to funds that charge 12b-1 fees at the ceiling while "Control Funds" refers to funds that do not charge 12b-1 fees at the ceiling.

for fund characteristics are size, age, turnover ratio, cash ratio, investment objective, growth in net assets, Herfindahl index, market adjusted return, and fund complexity.

The results of matching funds using the propensity score algorithm are presented in Table 6 to show the effectiveness of our matching approach. We compare the key characteristics of our target funds to those of the control sample. The statistical insignificant *t*-statistics obtained from simple difference in means tests shows that our procedure is effective. There are no significant differences between the two fund groups, except that one charges 12B-1 fees at the ceiling.

< Insert Table 6 here >

We use the Fama and French's (1993) three factor and Carhart's (1997) four factor models to examine the performance of treatment and control funds as shown in equation (7) and (8).

Fama-French Three Factor:

$$r_{Fd} - R_f = \alpha + \beta_1(R_m - R_f) + \beta_2 SMB + \beta_3 HML + \varepsilon_{Fd} \quad (7)$$

Carhart Four Factor:

$$r_{Fd} - R_f = \alpha + \beta_1(R_m - R_f) + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + \varepsilon_{Fd} \quad (8)$$

In the specifications, r_{Fd} is fund's quarterly return, R_f is risk-free return rate, R_m is the return of the S&P500 market, SMB is "Small Minus Big" which accounts for the spread in returns between small and large-sized funds based on total net assets under management, HML is "High Minus Low" which accounts for the spread in returns between value and growth funds, and UMD which represents the momentum factor loadings.

To compute the alpha, in every quarter, we run the three and four factor regression models using data from the past three years for each fund in our treatment and control samples.

In order to examine the impact of ceilings on fund flow, we create the FUNDFLOW variable similar to Sirri and Tufano (1998):

$$FUNDFLOW_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} * (1 + R_{i,t})}{TNA_{i,t-1}}, \quad (9)$$

where $FUNDFLOW_{i,t}$ is the level of individual fund flow, $TNA_{i,t}$ is the total net assets of the fund, and $R_{i,t}$ is the fund's return over the prior year.

Using FUNDFLOW as dependent variable, we estimate two separate regressions to examine how fund characteristics in our treatment and control groups explain the level of fund flow into and out of equity funds.[21]

6. Results

6.1 Impact of Ceilings on Regulated Fund Charges and Substitution Effect

From Table 7A, for load funds sub-sample, we find evidence in support of previous literature that investors are being exploited by fund managers through 12b-1 fee. In the first half, we find statistically significant support for our conjecture as evidenced by a decreasing magnitude of 12B-1GAP in the coefficients on our yearly time dummies from 1993 to 2003. This can be explained from previous findings that fund managers are taking advantage of mutual fund investors who are largely unaware of operating expenses such as 12b-1 fee (Barber, Odean and Zheng, 2005) or alternatively buying funds that attracted them through advertising or distribution channel (Jain and Wu, 2000). The difference between the magnitude of the 2003 and 1993 coefficients in Model 2 implies 12b-1 fees changed 632.65% to move towards the regulated

[21] The addition of INSTITUTIONAL and LOAD variable do not create multicollinearity issue due to low correlation with other independent variables. The GROWTHTNA variable is dropped to remove any biases that may arise due to perfect predictability in explaining dependent variable (FUNDFLOW) with correlation of 99.4% between these two variables. This is explained by Sirri and Tufano (1998) which defined net flows as the net growth in fund assets beyond reinvested dividends which is closely approximated by our GROWTHTNA variable.

ceiling. In the latter part of our sample period, however, the gap increases by 0.03% from 2004 to 2008.[22] The most probable explanation for this phenomenon is increasing competition in the mutual fund industry due to more rapid entry. This explanation is supported by Wahal and Wang (2010) who show an improved competitive environment in the industry from the late 1990s due to increased entry. Note that our findings are tilted towards supporting the exploitation of 12b-1 fee by fund managers despite the reversal in the 12b-1GAP trend in the latter period. The reversal has clearly not compensated for the full magnitude of the exponential rate of movement towards charging 12B-1 fees closer to the ceiling experienced in the 1990s.

In Table 7B, looking at no-load funds sub-sample, we observe a decreasing 12b-1GAP in the second half of our sample period instead. Looking at Table 7A and 7B in combination, we present evidence of substitution effect between 12b-1 and loads fee in the second half of our sample period. In other words, we observe load (no-load) funds charging lower (higher) 12b-1 fees when the U.S. mutual fund market starts to gain its competitiveness amongst open-ended funds. The peculiarity in our result only in the second half rather than the whole sample period necessitates further tests. We repeat the regression and found similar results on large versus small funds, growth versus income funds, institutional versus retail funds, and lastly large versus small fund families for both load and no-load fund sub-samples. Our results, unreported for brevity and available upon request, remain materially unchanged.

Several aspects of our results deserve further discussion. All five model specifications in Table 7A and 7B show that larger and older load and no-load funds are positively associated with the level of 12B-1GAP. This means larger and older load and no-load funds charge 12b-1 fees further away from the ceiling. All these findings reflect economies of scale achieved by

[22] These calculations are done by taking 1992 as base year. The yearly time dummies coefficients (Y1993 through Y2008) represent the difference between the average 12b-1 GAP in 1992 and Y(1993:2008).

larger and older funds. Load and no-load funds with higher levels of turnover are observed to have a closer proximity to the 12b-1 fee cap. That is, such funds are more likely to charge 12b-1 fees at the ceiling. This finding is consistent with the view that funds with high turnover tend to adopt an active management strategy which results in higher transaction or trading costs.

Finally, equity funds from large fund family complexes tend to have higher 12b-1 fees. This finding reflects the usage of 12b-1 fees as a marketing tool generally for large fund families to expand their net assets base. Sirri and Tufano (1998) use fund complex size as a proxy for search costs since large fund families generally attempt to increase recognition and brand awareness through a variety of marketing and selling activities, explaining higher 12b-1 fees for larger fund complexes. Our findings could also be partially explained by the cross-fund subsidization issue raised by Gaspar et al. (2004) in which mutual fund families strategically adjust their portfolio management strategies in favor of certain funds at the expense of others. These issues will be further examined when we examine the co-existence of charging 12b-1 fees closer to the regulated ceiling and discretionary fees.

< Insert Table 7A and 7B here >

As a further test, we analyze the effect of 12b-1 fee on management and non 12b-1 fees after controlling for other variables that have an impact on 12b-1 fee. In other words, we want to test whether fund managers substitute regulated 12b-1 fee for other discretionary fees such as management and non 12b-1 fees. A negative sign on the 12b1 ratio would indicate that such substitution is taking place. From Table 8, most of the coefficients on the 12b1 ratio is positive and significant, that is, no substitution seem to take place between 12b-1 fee and both management and non 12b-1 fees. The exception to this finding is the substitution effect observed between 12b-1 and non 12b1 fee for load funds. Overall, our finding suggests that 12b-1 fees are

used to shift marketing and distribution expenses onto current shareholders through higher management and non 12b-1 fees and will be examined further using a double hurdle model.

< Insert Table 8 here >

6.2 Impact of Ceilings on Discretionary Fees

We now turn to examining the relationship between 12b-1 fee setting strategies and other discretionary fees. From the output of our double hurdle model reported in Table 9, fund size and age are negatively related to the probability of funds charging 12b-1 fees at the ceiling. However, once the decision to charge 12b-1 fees at the ceiling has been made, fund size assumes a significant, negative effect on management and non 12b-1 fees. In addition, equity funds with high turnover ratios are more likely to charge 12b-1 fees at the ceiling and subsequently higher management and non 12b-1 fees. In addition, we find that equity funds with high cash holdings are negatively associated with the decision to set 12b-1 fees at the ceiling. In the event that the decisions are made to set 12b-1 fees at the ceiling, the cash ratio has a positive effect on the level of non 12b-1 fees. This can be explained from the opportunity costs of holdings cash to meet investors' redemption demands as opposed to investing in portfolio management.

Equity funds with a growth investment strategy have a higher probability of charging 12b-1 fees at the ceiling and this finding is significant at the 1% level. If 12b-1 fees are set at the ceiling, growth equity funds tend to charge lower management and non 12b-1 fees. Furthermore, funds with high growth in net assets are less likely to charge 12b-1 fees at the ceiling and instead, charge lower management fees and, where applicable, higher non 12b-1 fees. This phenomenon is consistent with Table 7A where we showed that load funds which experience high growth in net assets do not rely on marketing fees to further increase their assets base but rather other discretionary fees. Similarly, we find that equity funds with high market adjusted

returns charge higher non 12b-1 fees. Finally, consistent with Table 7, equity funds from large fund complex tend to charge 12b-1 fees at the ceiling and lower non 12b-1 fees. As robustness test, we split our sample pre- and post-1999 to take into account of structural shift in the competition level amongst U.S. equity funds for load and no-load funds. Overall, in our unreported result, we do not observe much substitution effects between mutual fund fees but rather strong observation that fund managers simply shift their expenses (expense-shifting) to discretionary fees at the expense of mutual fund investors who are largely unaware of such fee-setting activities despite competition in the second half period (post-1999).

< Insert Table 9 here >

6.3 Impact of Ceilings on Performance and Fund Flow

What is the economic impact of fee setting strategies around ceilings? To answer this question, we match control funds with treatment funds using the propensity score matching algorithm described earlier on. The debate in the previous literature regards the 12b-1 fee as a deadweight cost. Consistent with this view, using Fama-French's three factor and Carhart's four factor quarterly returns after operating expenses (Net Return) in Table 10, we show that our control funds outperform the treatment funds for load funds sub-sample.[23] Despite lack of evidence on no-load funds sub-sample, our findings on load funds can be generalize into the population of U.S. equity funds due to its market share. Hence, our finding contradicts the contention that funds that charge 12b-1 fees at the ceiling use this marketing fee to grow their asset base (economies of scale). Instead, such funds seem to incur higher operating expenses, and record lower performance.

< Insert Table 10 here >

[23] The results also hold for fund returns before deducting operating expenses or gross return.

As shown in Table 11, consistent with the previous literature, this study finds that money inflows are positively related to past performance regardless of whether 12b-1 fees are charged at the ceiling or not, although it is only significant for treatment funds. The coefficient on the INSTITUTIONAL dummy variable is negative (positive) and statistically significant for funds that charge 12b-1 fees at (below) the ceiling. This finding shows fund outflows are primarily caused by institutional investors who seem to be generally well-informed and avoid funds that charge 12b-1 fees at the ceiling. Furthermore, equity funds that charge some form of load also experience negative flows when 12b-1 fees are charged at the ceiling, confirming investors are generally more sensitive to "salient in-your-face fees" such as loads as reported by Wilcox (2003) and Barber, Odean and Zheng (2005).

< Insert Table 11 here >

7. Policy and Practical Implications

The findings of this study have significant implications for policymakers and investors. Based on our findings, policy makers should consider revising fee ceilings over time in line with increasing competition. More generally, policymakers should reconsider the effectiveness of introducing regulated fund fees such as 12b-1 plans as a means of protecting investors from exploitation by fund managers. Our results imply ceilings present fund managers with perverse incentives that are only diluted by a shock to the competitive environment, likely increased of entry into U.S. mutual funds market. As well, the overall regulation of fees may need to be revised to take into account the dynamic nature of fund managers' reaction to imposed fee ceilings and investors' protection. While ceilings in other industrial settings target specific prices, the value chain in the mutual fund sector enables fund managers to use discretionary fees to compensate for restrictions imposed on the main types of fees.

Furthermore, the findings from this study also convey valuable information to investors who are particularly sensitive to "salient in-your-face fees" such as loads, while being less mindful of other fees which are not usually disclosed, even though both types of fees lower overall performance.[24] This is particularly useful for individual investors who are, arguably, uninformed and continuously invest in non-performing funds with high mutual fund fees.[25]

8. Conclusion

We examine the consequences of fee regulation using the U.S. mutual fund industry as a test laboratory. While many studies have conclude that 12b-1 fee as deadweight cost, none of these studies have considered the impact of regulated fee ceiling of 12b-1 fee on mutual fund behavior.

We make several important contributions to the mutual fund literature. First, we find evidence in support of the previous literature that investors are not generally sensitive to 12b-1 fee which lead to the exploitation of investors by fund managers. U.S. equity funds gravitate towards regulated ceilings, particularly in the period 1993 to 2003 for load funds and from 1999 to 2008 for no-load funds sub-samples. Even after taking account of economies of scale, funds that charge 12b-1 fees are more likely to raise the fees towards the ceiling, supporting the arguments that such fees constitute merely a deadweight cost. This finding is potentially important for regulators who often argue that non-binding ceilings are not detrimental to competition. Furthermore, we present evidence of substitution effect between load and 12b-1 fee in the second half of our sample period for both load and no-load funds. In our further test, we

[24] See Wilcox (2003) and Barber, Odean and Zheng (2005).
[25] See Zheng (1999), Elton, Gruber and Busse (2004), Barber, Odean and Zheng (2005), among others.

show that fund managers simply use 12b-1 fees to shift marketing and distribution expenses onto current shareholders through higher management and non 12b-1 fees.

Second, we present evidence that the decision to set 12b-1 fees at the ceiling has a significant positive effect on management and non 12b-1 fees too. This finding suggests that equity funds use higher discretionary fees as compensation for the restrictions imposed on 12b-1 fee income. The result is particularly important for the mutual fund industry, given the fragmented nature of revenue streams for fund managers. Fee ceilings imposed on mutual funds therefore potentially have more complex implications, through their ability to affect related and unrelated fees, than other industrial settings that have been the subject of the literature to date.

Third, we provide empirical evidence on the economic consequences of setting ceilings. We find that funds that charge 12b-1 fees at the ceiling underperform and suffer negative fund flows than funds that do not. Our results are in support of Wilcox (2003) and Barber, Odean and Zheng (2005) who show that investors are particularly sensitive to salient, so-called in-your-face fees, such as loads while being less mindful of operating expenses which also affect investors' returns. Furthermore, we also find that institutional shareholdings and funds that charge loads are negatively related to fund flow when 12b-1 fees are charged at the ceiling.

This study has policy implications. We conclude that the regulated fee cap on marketing related fees in U.S. has contributed significantly to an increase in total expense ratios over our early sample period. While the regulation of fees was meant to control mutual fund expenses passed on to investors, there has been an increase in the number of funds charging 12b-1 fees at the ceiling. A reversal of the trend in more recent years for load funds due to increased competition has not matched the exponential rate at which funds moved towards the ceiling in the time following the introduction of the fee (1993 to 2003). Taken together, our findings

contradict the argument that charging marketing related fees to mutual fund investors is good for their welfare, bringing into question the decision to set price ceilings for financial services products in the first place.

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Table 1: Correlation Matrix of Equity Fund Variables

This table presents a correlation matrix of all independent variables used in this study. SIZE is the total net assets value of the fund (millions). AGE is the number of years since funds' inception. NAV is the funds' net assets value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. GROWTHTNA is the growth in net assets over the prior (one year) period. HERFINDAHL is a measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise.

	SIZE	AGE	NAV	TURNOVER	CASHRATIO	GROWTH	GROWTHTNA	HERFINDAHL	MAR	FUNDCOMPLEX
SIZE	1.000	0.389	0.331	-0.105	0.002	0.079	-0.030	0.030	-0.012	0.009
AGE		1.000	0.120	-0.009	0.002	0.088	-0.122	0.019	0.002	-0.082
NAV			1.000	-0.157	-0.048	0.060	0.015	0.090	-0.017	-0.036
TURNOVER				1.000	0.096	-0.048	0.010	-0.022	0.009	0.020
CASHRATIO					1.000	-0.057	0.049	0.002	0.014	-0.069
GROWTH						1.000	0.000	0.041	-0.060	-0.062
GROWTHTNA							1.000	0.110	0.042	0.008
HERFINDAHL								1.000	-0.170	-0.025
MAR									1.000	0.006
FUNDCOMPLEX										1.000

Table 2: Descriptive Statistics on Sample Equity Funds

This table provides descriptive statistics for U.S. equity funds from 1992 to 2008. SIZE is the total net assets value of the fund (millions). AGE is the number of years since the fund's inception. LNSIZE is the natural logarithm of SIZE. LNAGE is the natural logarithm of AGE. NAV is the fund net asset value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. GROWTHTNA is the growth in net assets over the prior period. HERFINDAHL is a measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. EXPRATIO is the ratio of funds' operating expense over the total net assets. MANFEE are the fees paid out of fund assets to the funds' investment adviser. 12B1FEE is the fee paid for the distribution and marketing of funds. NON12B1 is calculated by subtracting 12b-1 fee from the expense ratio. 12B-1GAP is the difference (percentage) between the 12b-1 fee ceiling and the actual 12b-1 charged by funds. 12B-1CEILING is an indicator variable that equals 1 if the fund charged 12b-1 fee at the ceiling and 0 otherwise. Notation (L) and (NL) refer to Load and No-Load funds.

	Mean	Median	Std. Dev.	Minimum	Maximum
SIZE ($ million)	277.670	27.400	840.279	0.100	6197.500
AGE (years)	6.326	4.583	6.854	0.000	44.333
LNSIZE	3.083	3.311	2.662	-2.303	8.732
LNAGE	1.360	1.540	1.115	-2.485	3.792
NAV	16.515	13.180	11.033	3.280	69.210
TURNOVER	0.923	0.660	1.031	0.020	7.170
CASHRATIO (%)	4.282	2.400	6.409	-2.690	42.340
GROWTH	0.318	0.000	0.466	0.000	1.000
GROWTHTNA	1.124	1.000	0.819	0.000	7.000
HERFINDAHL	566.119	572.414	35.424	496.652	649.469
MAR (%)	0.661	0.423	3.168	-9.755	11.580
FUNDCOMPLEX	0.968	1.000	0.149	0.000	1.000
EXPRATIO (%)	1.468	1.400	0.648	0.090	3.190
MANFEE (%)	0.489	0.700	0.990	-6.482	1.500
12B1 FEE (%)	0.585	0.500	0.373	0.000	1.000
NON12B1 (%)	1.108	1.100	0.452	-0.910	3.190
12B-1GAP(L) (%)	0.362	0.250	0.360	0.000	1.000
12B-1CEILING(L)	0.384	0.000	0.486	0.000	1.000
12B-1GAP(NL) (%)	0.151	0.236	0.114	0.000	0.250
12B-1CEILING(NL)	0.292	0.000	0.455	0.000	1.000

Table 3: Descriptive Statistics on Equity Funds According to Fund Size

This table provides descriptive statistics for U.S. equity funds from 1992 to 2008. SIZE is the total net assets value of the fund (millions). AGE is the number of years since the fund's inception. NAV is the fund net asset value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. GROWTHTNA is the growth in net assets over the prior period. HERFINDAHL is a measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. EXPRATIO is the ratio of funds' operating expense over the total net assets. MANFEE are the fees paid out of fund assets to the funds' investment adviser. 12B1FEE is the fee paid for the distribution and marketing of funds. NON12B1 is calculated by subtracting 12b-1 fee from the expense ratio. 12B-1GAP is the difference (percentage) between the 12b-1 fee ceiling and the actual 12b-1 charged by funds. 12B-1CEILING is an indicator variable that equals 1 if the fund charged 12b-1 fee at 1% and 0 otherwise. Notation (L) and (NL) refer to Load and No-Load funds.

	Tercile 1	**Tercile 2**	**Tercile 3**
SIZE ($ million)	797.805	32.798	2.405
AGE (years)	10.024	5.777	3.184
NAV	20.594	15.465	13.330
TURNOVER	0.743	0.955	1.103
CASHRATIO (%)	4.147	4.286	4.288
GROWTH	0.330	0.303	0.322
GROWTHTNA	1.079	1.131	1.165
HERFINDAHL	567.882	565.595	565.074
MAR (%)	0.696	0.672	0.625
FUNDCOMPLEX	0.974	0.957	0.973
EXPRATIO (%)	1.203	1.567	1.691
MANFEE (%)	0.663	0.622	0.095
12B1 FEE (%)	0.482	0.621	0.647
NON12B1 (%)	0.942	1.156	1.220
12B-1GAP(L) (%)	0.464	0.325	0.287
12B-1CEILING(L)	0.302	0.426	0.428
12B-1GAP(NL) (%)	0.158	0.154	0.141
12B-1CEILING(NL)	0.283	0.275	0.320

Table 4: Statistics on Equity Funds Charging 12B-1 Fee at and below the Ceiling

This table reports statistics on the number of equity funds charging 12b-1 fee at the ceiling as indicated by 12B-1CEILING = 1 and below the ceiling as represented by 12B-1CEILING = 0 in the U.S. mutual fund industry from 1992 to 2008. Load funds are funds that charge either front-end or rear load (or both) while no-load funds are classified as funds that do not charge both front-end and rear load, and charging 12b-1 fee lower than 0.25%.

Overview	1992	1993	1994	1995	1996	1997	1998	1999	2000
No. of load funds	860	1155	1723	1937	2344	3047	4497	5396	6506
No. % 12B-1CEILING = 1	86	173	371	443	600	837	862	913	1412
% 12B-1CEILING = 1	10.00%	14.98%	21.53%	22.87%	25.60%	27.47%	19.17%	16.92%	21.70%
No. of no-load funds	388	506	698	815	985	1386	1360	1187	236
No. % 12B-1CEILING = 1	27	27	58	64	84	159	120	120	129
% 12B-1CEILING = 1	6.96%	5.34%	8.31%	7.85%	8.53%	11.47%	8.82%	10.11%	54.66%

Overview	2001	2002	2003	2004	2005	2006	2007	2008
No. of load funds	7174	7775	8220	8444	8871	9141	9332	9066
No. % 12B-1CEILING = 1	1713	2075	2344	2404	2484	2467	2532	2613
% 12B-1CEILING = 1	23.88%	26.69%	28.52%	28.47%	28.00%	26.99%	27.13%	28.82%
No. of no-load funds	224	222	187	184	194	185	183	171
No. % 12B-1CEILING = 1	115	128	101	99	106	94	94	86
% 12B-1CEILING = 1	51.34%	57.66%	54.01%	53.80%	54.64%	50.81%	51.37%	50.29%

Table 5: Univariate Statistics of Equity Funds charging 12B-1 fee at and below the Ceiling[26]

This table provides descriptive statistics for U.S. equity funds from 1992 to 2008. SIZE is the total net assets value of the fund (millions). AGE is the number of years since the fund's inception. NAV is the fund net asset value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. GROWTHTNA is the growth in net assets over the prior period. HERFINDAHL is a measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. EXPRATIO is the ratio of funds' operating expense over the total net assets. MANFEE are the fees paid out of fund assets to the funds' investment adviser. 12B1FEE is the fee paid for the distribution and marketing of funds. NON12B1 is calculated by subtracting 12b-1 fee from the expense ratio. 12B-1GAP is the difference (percentage) between the 12b-1 fee ceiling and the actual 12b-1 charged by funds. 12B-1CEILING is an indicator variable that equals 1 if the fund charged 12b-1 fee at 1% and 0 otherwise. Notation (L) and (NL) refer to Load and No-Load funds.

MEAN	**12B-1CEILING = 0**		**12B-1CEILING = 1**		**Load**		**No Load**	
Variables	**Load**	**No Load**	**Load**	**No Load**	**T-statistics**	**p-value**	**T-statistics**	**p-value**
SIZE ($ million)	301.230	797.891	133.783	444.086	50.898	0.000	14.271	0.000
AGE (years)	7.572	9.858	5.710	11.538	62.644	0.000	-9.195	0.000
NAV	16.008	18.807	15.165	18.518	20.903	0.000	1.500	0.134
TURNOVER	0.906	0.797	0.955	0.998	-11.830	0.000	-13.711	0.000
CASHRATIO (%)	4.316	5.215	4.087	4.667	8.633	0.000	4.262	0.000
GROWTH	0.305	0.374	0.316	0.321	-5.526	0.000	6.553	0.000
GROWTHTNA	1.108	1.192	1.075	1.067	12.608	0.000	7.797	0.000
HERFINDAHL	568.720	588.397	566.659	564.934	13.634	0.000	37.105	0.000
MAR (%)	0.656	0.478	0.584	0.757	5.255	0.000	-5.040	0.000
FUNDCOMPLEX	0.973	0.919	0.995	0.921	-46.951	0.000	-0.429	0.668
EXPRATIO (%)	1.559	1.016	2.131	1.346	-260.000	0.000	-40.912	0.000
MANFEE (%)	0.484	0.535	0.526	0.673	-9.855	0.000	-8.832	0.000
12B1 FEE (%)	0.411	0.036	1.000	0.250	-620.000	0.000	-210.000	0.000
NON12B1 (%)	1.148	0.980	1.131	1.096	9.078	0.000	-14.752	0.000
12B1-GAP(L) (%)	0.588		0.000		621.577	0.000		
12B1-GAP(NL) (%)		0.214		0.000			205.629	0.000

[26] The mean for both samples (12B-1CEILING = 1) and (12B-1CEILING = 0) are compared using T-Test assuming equal variances due to homogeneous sample.

Table 6: Propensity Score Matching Algorithm of 12B-1CEILING = 1 and 12B-1CEILING = 0 (T-test for mean differences)

This table presents the result of simple difference in means tests between the key characteristics of (treatment) funds that charge 12b-1 fees at the ceiling and (control) funds that do not, matched using the propensity score procedure. Propensity scores are computed as follows: On a yearly basis, we compute propensity score using logistic regression model by denoting the dependent variable as 1 for funds that charge 12b-1 fees at the ceiling, and 0 otherwise. We then sort the observations in both treatment and control groups from lowest to highest propensity scores before using the nearest-neighbour matching method to find a control fund for every treatment fund. Finally, we pool the estimated propensity scores across the years (1992 through 2008). The following independent variables are used: SIZE is the total net assets value of the fund (millions). AGE is the number of years since the fund's inception. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted a growth investment strategy. GROWTHTNA is the growth in net assets over the prior period. HERFINDAHL is the measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. At the bottom of the table, we report t-statistics for tests of the null hypothesis that the treatment sample (FEECAP = 1) is equal to control sample (FEECAP = 0).

Load	(1)	(2)	HO: (1) - (2) ≠ 0	
Statistic	**12B-1CEILING = 0**	**12B-1CEILING = 1**	**T-statistic**	**P-value**
SIZE	286.956	278.012	1.000	0.317
AGE	6.549	6.459	1.280	0.200
TURNOVER	1.246	1.255	-0.575	0.566
CASHRATIO	6.294	6.430	-1.394	0.163
GROWTH	0.318	0.318	0.000	1.000
GROWTHTNA	1.208	1.210	-0.208	0.835
HERFINDAHL	564.805	564.805	0.000	1.000
MAR	0.784	0.748	0.744	0.457
FUNDCOMPLEX	0.987	0.987	0.000	1.000

No Load	(3)	(4)	HO: (3) - (4) ≠ 0	
Statistic	**12B-1CEILING = 0**	**12B-1CEILING = 1**	**T-statistic**	**P-value**
SIZE	322.159	310.535	0.485	0.628
AGE	11.253	11.101	0.409	0.683
TURNOVER	0.856	0.918	-2.303	0.021
CASHRATIO	3.637	3.970	-1.624	0.105
GROWTH	0.339	0.339	0.000	1.000
GROWTHTNA	1.068	1.076	-0.323	0.747
HERFINDAHL	569.087	569.087	0.000	1.000
MAR	0.716	0.773	-0.458	0.647
FUNDCOMPLEX	0.928	0.928	0.000	1.000

Table 7A: Analysis of Equity Funds' Proximity to 12B-1 Fee Cap (Load Funds)

This table provides results of regressions relating the level of 12B-1GAP to characteristics of equity funds. The dependent variable, 12B-1GAP(L) is the difference (percentage) between the 12b-1 fee ceiling and the actual 12b-1 charged by funds. The independent variables are: SIZE is the total net assets value of the fund (millions). AGE is the number of years since the fund's inception. LNSIZE is the natural logarithm of SIZE. LNAGE is the natural logarithm of AGE. NAV is the fund net asset value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. GROWTHTNA is the growth in net assets over the prior period. HERFINDAHL is a measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. Yearly time dummies are incorporated to examine the level of 12b-1 fee over the sample period. Standard error is in parentheses. *, ** and *** significant at the 10%, 5% and 1% levels, respectively.

12B-1GAP(L)	**1**		**2**		**3**		**4**		**5**	
CONSTANT	0.471	***	1.008	***	1.013	***	0.956	***	0.975	***
	(0.000)		(0.025)		(0.025)		(0.025)		(0.025)	
SIZE	0.000	***	0.000	***	0.000	***				
	(0.000)		(0.000)		(0.000)					
AGE	0.009	***	0.008	***			0.007	***		
	(0.000)		(0.000)				(0.000)			
LNSIZE							0.022	***	0.027	***
							(0.000)		(0.000)	
LNAGE					0.054	***			0.033	***
					(0.001)				(0.001)	
NAV	-0.000	***	-0.000	**	-0.000	***	-0.000	***	-0.000	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
TURNOVER	-0.000		0.000		0.000		0.004	***	0.004	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
CASHRATIO	0.001	***	0.000	***	0.000	***	0.000	***	0.000	***
	(0.001)		(0.000)		(0.000)		(0.000)		(0.000)	
GROWTH	-0.021	***	-0.020	***	-0.017	***	-0.019	***	-0.015	***
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
GROWTHTNA	0.030	***	0.015	***	0.017	***	0.017	***	0.015	***
	(0.000)		(0.001)		(0.001)		(0.001)		(0.001)	
HERFINDAHL	0.000	***	0.000		0.000		-0.000		-0.000	
	(0.025)		(0.000)		(0.000)		(0.000)		(0.000)	
MAR	0.152	***	0.125	***	0.115	***	0.120	***	0.115	***
	(0.007)		(0.025)		(0.025)		(0.025)		(0.025)	
FUNDCOMPLEX	-0.460	***	-0.423	***	-0.425	***	-0.420	***	-0.424	***
	(0.014)		(0.007)		(0.007)		(0.007)		(0.007)	
Y1993			-0.049	***	-0.058	***	-0.054	***	-0.056	***
			(0.017)		(0.018)		(0.017)		(0.018)	
Y1994			-0.076	***	-0.084	***	-0.073	***	-0.079	***
			(0.016)		(0.016)		(0.016)		(0.016)	
Y1995			-0.114	***	-0.132	***	-0.111	***	-0.123	***
			(0.016)		(0.016)		(0.016)		(0.016)	

Y1996		-0.141	***	-0.166	***	-0.139	***	-0.156	***
		(0.015)		(0.015)		(0.015)		(0.015)	
Y1997		-0.167	***	-0.191	***	-0.163	***	-0.183	***
		(0.014)		(0.015)		(0.014)		(0.015)	
Y1998		-0.204	***	-0.227	***	-0.198	***	-0.218	***
		(0.015)		(0.015)		(0.015)		(0.015)	
Y1999		-0.272	***	-0.297	***	-0.265	***	-0.287	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2000		-0.344	***	-0.372	***	-0.338	***	-0.363	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2001		-0.348	***	-0.377	***	-0.341	***	-0.366	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2002		-0.354	***	-0.384	***	-0.342	***	-0.365	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2003		-0.359	***	-0.390	***	-0.344	***	-0.366	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2004		-0.358	***	-0.388	***	-0.342	***	-0.365	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2005		-0.358	***	-0.390	***	-0.342	***	-0.365	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2006		-0.356	***	-0.387	***	-0.339	***	-0.361	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2007		-0.353	***	-0.383	***	-0.336	***	-0.357	***
		(0.013)		(0.013)		(0.013)		(0.013)	
Y2008		-0.347	***	-0.377	***	-0.327	***	-0.346	***
		(0.013)		(0.013)		(0.013)		(0.013)	
No. of observations	198704	198704		198672		198704		198672	
Adjusted R2	0.08	0.1		0.0879		0.1083		0.0944	
F-statistic	1727.74	850.12		737.75		929.29		797.94	

Table 7B: Analysis of Equity Funds' Proximity to 12B-1 Fee Cap (No Load Funds)

This table provides results of regressions relating the level of 12B-1GAP to characteristics of equity funds. The dependent variable, 12B-1GAP(NL) is the difference (percentage) between the 12b-1 fee ceiling and the actual 12b-1 charged by funds. The independent variables are: SIZE is the total net assets value of the fund (millions). AGE is the number of years since the fund's inception. LNSIZE is the natural logarithm of SIZE. LNAGE is the natural logarithm of AGE. NAV is the fund net asset value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. GROWTHTNA is the growth in net assets over the prior period. HERFINDAHL is a measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. Yearly time dummies are incorporated to examine the level of 12b-1 fee over the sample period. Standard error is in parentheses. *, ** and *** significant at the 10%, 5% and 1% levels, respectively.

12B-1GAP(NL)	1		2		3		4		5	
CONSTANT	-1.319	***	0.013		-0.025		-0.084		-0.121	
	(0.044)		(0.082)		(0.083)		(0.083)		(0.084)	
SIZE	0.000	***	0.000	***	0.000	***				
	(0.000)		(0.000)		(0.000)					
AGE	0.001	***	0.007	***			0.007	***		
	(0.000)		(0.000)				(0.000)			
LNSIZE							0.028	***	0.030	***
							(0.001)		(0.001)	
LNAGE					0.064	***			0.065	***
					(0.003)				(0.003)	
NAV	-0.002	***	-0.002	***	-0.002	***	-0.001	***	-0.001	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
TURNOVER	0.020	***	0.013	***	0.014	***	0.015	***	0.016	***
	(0.003)		(0.002)		(0.003)		(0.003)		(0.003)	
CASHRATIO	0.000	**	-0.002	***	-0.002	***	-0.002	***	-0.002	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
GROWTH	0.075	***	0.054	***	0.058	***	0.055	***	0.061	***
	(0.005)		(0.005)		(0.005)		(0.005)		(0.005)	
GROWTHTNA	0.026	***	-0.010	***	-0.009	**	-0.008	**	-0.008	**
	(0.003)		(0.003)		(0.003)		(0.003)		(0.003)	
HERFINDAHL	0.002	***	0.000	***	0.000	***	0.000	***	0.000	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
MAR	0.002		-0.059		-0.062		-0.094		-0.104	
	(0.085)		(0.078)		(0.079)		(0.079)		(0.079)	
FUNDCOMPLEX	-0.460	***	-0.306	***	-0.315	***	-0.318	***	-0.330	***
	(0.014)		(0.013)		(0.013)		(0.013)		(0.013)	
Y1993			0.022		0.023		0.024		0.026	
			(0.026)		(0.026)		(0.026)		(0.026)	
Y1994			-0.033		-0.028		-0.024		-0.019	
			(0.025)		(0.025)		(0.025)		(0.026)	
Y1995			-0.038		-0.043		-0.032		-0.037	
			(0.026)		(0.026)		(0.026)		(0.026)	

Y1996		-0.019		-0.029		-0.011		-0.022	
		(0.023)		(0.024)		(0.024)		(0.024)	
Y1997		0.001		-0.002		0.015		0.009	
		(0.022)		(0.022)		(0.022)		(0.022)	
Y1998		-0.022		-0.033		-0.006		-0.018	
		(0.023)		(0.023)		(0.023)		(0.023)	
Y1999		-0.118	***	-0.131	***	-0.102	***	-0.117	***
		(0.020)		(0.020)		(0.020)		(0.021)	
Y2000		-0.397	***	-0.416	***	-0.387	***	-0.409	***
		(0.023)		(0.023)		(0.023)		(0.023)	
Y2001		-0.415	***	-0.436	***	-0.403	***	-0.424	***
		(0.023)		(0.023)		(0.023)		(0.023)	
Y2002		-0.425	***	-0.447	***	-0.412	***	-0.433	***
		(0.022)		(0.022)		(0.022)		(0.022)	
Y2003		-0.460	***	-0.484	***	-0.449	***	-0.471	***
		(0.021)		(0.022)		(0.022)		(0.022)	
Y2004		-0.481	***	-0.505	***	-0.471	***	-0.494	***
		(0.021)		(0.021)		(0.021)		(0.021)	
Y2005		-0.487	***	-0.511	***	-0.479	***	-0.501	***
		(0.021)		(0.021)		(0.021)		(0.021)	
Y2006		-0.498	***	-0.521	***	-0.491	***	-0.513	***
		(0.021)		(0.021)		(0.021)		(0.021)	
Y2007		-0.503	***	-0.525	***	-0.496	***	-0.515	***
		(0.021)		(0.021)		(0.021)		(0.022)	
Y2008		-0.492	***	-0.512	***	-0.480	***	-0.497	***
		(0.021)		(0.022)		(0.021)		(0.022)	
No. of observations	12598	12598		12575		12598		12575	
Adjusted R2	0.1998	0.5028		0.5039		0.475		0.4762	
F-statistic	315.47	490.91		492.21		439.3		440.64	

Table 8: Test of substitution between 12b-1 fee and discretionary fees

This table provides the regression result of the level of discretionary fees on the characteristics of equity funds. The dependent variables are MANFEE (management fee) and NON12B1 (level of expense ratio after subtracting 12b-1 fee). The independent variables are: 12B1 RATIO is the 12b-1 fee expressed as a percentage of assets. SIZE is the total net assets value of the fund (millions). AGE is the number of years since funds' inception. NAV is the funds' net assets value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. GROWTHTNA is the growth in net assets over the prior period. HERFINDAHL is the measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. Standard error is in parentheses. *, ** and *** significant at the 10%, 5% and 1% levels, respectively.

	LOAD				NO LOAD			
Dependent Variable	**MANFEE**		**NON12B1**		**MANFEE**		**NON12B1**	
CONSTANT	0.071	*	1.905	***	0.347	**	1.226	***
	(0.040)		(0.017)		(0.164)		(0.058)	
12B1 RATIO	0.136	***	-0.022	***	0.387	***	0.435	***
	(0.005)		(0.002)		(0.077)		(0.032)	
LNSIZE	0.055	***	-0.046	***	0.045	***	-0.086	***
	(0.001)		(0.000)		(0.004)		(0.001)	
LNAGE	0.218	***	0.053	***	0.053	***	0.043	***
	(0.003)		(0.001)		(0.012)		(0.004)	
NAV	0.003	***	-0.003	***	-0.001	**	-0.000	
	(0.000)		(0.000)		(0.000)		(0.000)	
TURNOVER	0.086	***	0.101	***	-0.022	**	0.119	***
	(0.002)		(0.001)		(0.009)		(0.004)	
CASHRATIO	0.000		0.003	***	0.008	***	0.005	***
	(0.000)		(0.000)		(0.001)		(0.000)	
GROWTH	-0.091	***	-0.138	***	-0.095	***	-0.049	***
	(0.004)		(0.001)		(0.017)		(0.007)	
GROWTHTNA	-0.129	***	0.020	***	-0.109	***	0.004	
	(0.004)		(0.001)		(0.019)		(0.003)	
HERFINDAHL	-0.000	***	-0.000	***	0.000	*	0.000	***
	(0.000)		(0.000)		(0.000)		(0.000)	
MAR	-0.013		0.215	***	0.649	**	0.361	***
	(0.065)		(0.029)		(0.257)		(0.111)	
FUNDCOMPLEX	0.034	*	-0.603	***	-0.256	***	-0.517	***
	(0.020)		(0.008)		(0.040)		(0.015)	
No. of observations	188803		198668		8222		12575	
Adjusted R2	0.0966		0.1739		0.0426		0.3756	
F-statistic	1837.28		3803.12		34.25		688.72	

Table 9: Double Hurdle Model on Capped and Discretionary Fees

This table provides the results of a double hurdle model. The first hurdle is a probit model and the second hurdle is a truncated regression. The dependent variable for the first hurdle is 12B-1CEILING, an indicator variable that equals 1 if the fund charged 12b-1 fee at 1% and 0 otherwise. The two dependent variables for the second hurdle are MANFEE (management fee) and NON12B1 (level of expense ratio after subtracting 12b-1 fee). The independent variables are: SIZE is the total net assets value of the fund (millions). AGE is the number of years since the fund's inception. NAV is the fund net asset value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. GROWTHTNA is the growth in net assets over the prior period. HERFINDAHL is a measure of industry concentration. MAR is the fund's market adjusted return. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. LOAD is a dummy variable equal to one for load funds and zero for no-load funds. Standard error is in parentheses. *, ** and *** significant at the 10%, 5% and 1% levels, respectively.

	Probit Model		**Truncated Regression**			
	Setting 12B-1 Fees at the Ceiling		**Level of Management Fees Charged**		**Level of Non-12B-1 Fees Charged**	
Dependent Variable	**12B-1CEILING**		**MANFEE**		**NON12B1**	
CONSTANT	-0.388	***	1.662	***	1.704	***
	(0.057)		(0.222)		(0.015)	
LNSIZE	-0.057	***	-0.327	***	-0.050	***
	(0.001)		(0.006)		(0.000)	
LNAGE	-0.041	***	1.387	***	0.061	***
	(0.004)		(0.022)		(0.001)	
NAV	0.000		0.021	***	-0.002	***
	(0.000)		(0.001)		(0.000)	
TURNOVER	0.008	***	0.405	***	0.098	***
	(0.003)		(0.014)		(0.000)	
CASHRATIO	-0.004	***	0.002		0.003	***
	(0.000)		(0.001)		(0.000)	
GROWTH	0.041	***	-0.469	***	-0.141	***
	(0.006)		(0.024)		(0.001)	
GROWTHTNA	-0.086	***	-0.438	***	0.021	***
	(0.005)		(0.017)		(0.001)	
HERFINDAHL	-0.001	***	-0.002	***	-0.000	***
	(0.000)		(0.000)		(0.000)	
MAR	-0.314	***	-0.568		0.242	***
	(0.092)		(0.361)		(0.025)	
FUNDCOMPLEX	1.204	***	0.466	***	-0.526	***
	(0.031)		(0.086)		(0.005)	

LOAD	0.025	**	0.765	***	0.097	***
	(0.012)		(0.066)		(0.003)	
No. of observations	211247		242320		259362	
Log-likelihood	-137759.94		-225372.14		-131285.22	

Table 10: Performance between Treatment and Control Matched Funds using Propensity Score Matching Algorithm

This table provides the results on the performance between the treatment (12B-1CEILING = 1) and control (12B-1CEILING = 0) sample using both Three and Four Factor Alpha performance measures. Net return is the fund's quarterly return after taking into account of operating expenses. r = fund's quarterly net return; R_f = risk-free return rate; R_m = return of the S&P500 market; MKTRF = fund's excess return on the market; SMB = "Small Minus Big" which accounts for the spread in returns between small- and large-sized funds based on total net assets under management; HML = "High Minus Low" which accounts for the spread in returns between value and growth funds; UMD = momentum factor loading. *, ** and *** significant at the 10%, 5% and 1% levels, respectively.

$$r_{Fd} - R_f = \alpha + \beta_1(R_m - R_f) + \beta_2 SMB + \beta_3 HML + \beta_4 UMD + \varepsilon_{Fd}$$

	12B-1CEILING = 1		12B-1CEILING = 0			
LOAD	(Treatment)		(Control)		Difference	
Panel A: Three Factor Alpha	Net Return		Net Return		CAP(1) - CAP(0)	p-value
ALPHA	-0.0193	***	-0.0126	***	-0.0066	**
MKTRF	0.9970	***	1.0055	***		
SMB	0.1664	***	0.1778	***		
HML	-0.0825	***	-0.0778	***		
Observations	12665		12616			
Adjusted R2	0.5735		0.5771			
Panel B: Four Factor Alpha						
ALPHA	-0.0205	***	-0.0138	***	-0.0067	**
MKTRF	1.0222	***	1.0287	***		
SMB	0.1636	***	0.1748	***		
HML	-0.0503	***	-0.0481	***		
UMD	0.0403		0.0373			
Observations	12665		12616			
Adjusted R2	0.5742		0.5777			

	12B-1CEILING = 1		12B-1CEILING = 0			
NO LOAD	(Treatment)		(Control)		Difference	
Panel A: Three Factor Alpha	Net Return		Net Return		CAP(1) - CAP(0)	p-value
ALPHA	-0.0099	***	-0.0096	***	-0.0003	
MKTRF	1.0221	***	1.0381	***		
SMB	0.0062		0.0790	***		
HML	-0.0293		-0.0089			
Observations	1200		1200			
Adjusted R2	0.6459		0.6334			
Panel B: Four Factor Alpha	Net Return		Net Return			
ALPHA	-0.0109	***	-0.0105	***	-0.0004	
MKTRF	1.0225	***	1.0543	***		
SMB	0.0062		0.0764	**		
HML	-0.0287		0.0112			
UMD	0.0007		0.0286			
Observations	1200		1200			
Adjusted R2	0.6456		0.6335			

Table 11: Impact of Ceiling on Fund Flow

This table provides the regression result of the level of fund flow on the characteristics of equity funds. The dependent variable is FUNDFLOW is the level of individual fund flow. The independent variables are: SIZE is the total net assets value of the fund (millions). AGE is the number of years since funds' inception. NAV is the funds' net assets value. TURNOVER is the level of turnover for the fund calculated by dividing the average assets during the period by the lesser of the value of purchases and the value of sales during the same period. CASHRATIO is the ratio of fund assets in cash. GROWTH is a dummy variable indicating if a fund adopted growth investment strategy. HERFINDAHL is the measure of industry concentration. MAR is the fund's market adjusted return. LAGMAR is the lagged of MAR by one period. FUNDCOMPLEX is a variable that equals 1 if the fund is a member of a fund family with more than five funds, 0.5 if the fund is a member of a fund family with more than one fund but less than five, and 0 otherwise. INSTITUTIONAL is a dummy variable indicating institutional fund. LOAD is a dummy variable equal to one for load funds and zero for no-load funds. Standard error is in parentheses. *, ** and *** significant at the 10%, 5% and 1% levels, respectively.

	12B-1CEILING = 1 (Treatment)		12B-1CEILING = 0 (Control)	
Dependent Variable	**FUNDFLOW**		**FUNDFLOW**	
CONSTANT	-0.821	***	-1.544	*
	(0.265)		(0.808)	
LNSIZE	0.000		0.018	
	(0.006)		(0.020)	
LNAGE	-0.309	***	-0.312	***
	(0.018)		(0.058)	
NAV	-0.002	*	-0.007	**
	(0.001)		(0.003)	
TURNOVER	-0.038	***	-0.043	
	(0.010)		(0.031)	
CASHRATIO	-0.006	***	-0.006	
	(0.001)		(0.005)	
GROWTH	-0.036		-0.050	
	(0.028)		(0.085)	
HERFINDAHL	0.002	***	0.003	***
	(0.000)		(0.001)	
MAR	0.482		1.596	
	(0.333)		(1.027)	
LAGMAR	1.105	***	0.749	
	(0.309)		(0.949)	
FUNDCOMPLEX	0.415	***	0.353	
	(0.148)		(0.446)	
INSTITUTIONAL	-0.087	**	0.571	***
	(0.094)		(0.169)	
LOAD	-0.031	*	0.230	*
	(0.058)		(0.158)	
No. of observations	12504		12392	
Adjusted R2	0.0292		0.0342	