Price Competition in the Mutual Fund Industry[1]

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Abstract

We find a puzzling fact about the mutual fund industry that funds operating in more competitive segments charge higher fees. We argue that this surprising positive relation between competition and fund fees is consistent with strategic fee setting by funds. Fund performance is better and more persistent in less competitive segments, which attracts relatively more performance-sensitive investors. This leaves relatively less performance-sensitive investors in more competitive markets. Hence, funds operating in more competitive markets face a relatively inelastic demand curve and take advantage of it by increasing their fees (which reduces investors' net returns). Our findings have important policy implications that market competition on its own may not be sufficient to decrease the fund fees and that regulatory interventions are required to increase investor awareness of mutual fund fees and their adverse impacts on net fund performance.

JEL classification: G20, G23

Key Words: Fund fees, Price Competition, Mutual funds, Strategic Fee Setting

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1. Introduction

The mutual funds industry has grown very large over the last few decades. As of 2016, close to 56 million American households (about 96 million individuals) invested a total of $16.3 trillion in US-registered mutual funds, with a median household investment of about $125,000.[2] The mutual fund industry plays a key role in the economy. It manages savings and pensions of millions of people. It makes investment decisions which has important implications for investors' financial wellbeing. It promises superior returns in exchange for an annual fee[3]. However, investors bear almost all the portfolio risks and these annual fees adversely affect their returns. Hence, it is important to study if the investors pay excessive fees for the services they receive.

The USA mutual fund industry is one of the most regulated industry in the world, and yet, fund fees are typically set by the management companies themselves. This implies that investors rely on market competition to keep these fees low. However, there is an ongoing debate on the effectiveness of fund market competition in protecting the interests of small investors.

Historical data suggests that despite the growing economy of scale and competition, average fund fees have not decreased. The financial service sector has grown from 4.9 % of the GDP in 1980 to 7.2% in 2015. A significant share of this growth has come from the

[2] See ICI Fact Book 2017. This growth is not limited to the USA alone. As of 2016, the UK asset management industry, the second largest in the world, managed about £6.9 trillion of assets (see FCA Report (2017)) and the total asset under management of regulated open-ended funds worldwide was about $44.5 trillion.

[3] In addition to other transaction fees such as front load fees.

increase in the asset management fees. Over this period the assets under management have increased rapidly. In 1980, the total assets under management of equity funds was less than $26 billion; in 2016 the number grew to $6.86 trillion (domestic equity only) - a 264 times increase. Notwithstanding this enormous economy of scale, the asset-weighted expense ratio has in fact increased from 66 basis points in 1980 to 82 basis points in 2016. The average expense ratio in 2016 was higher - 1.28%. Expressed as a percentage, the fees do not appear that significant. However, assuming an average market return of 7% a year, the 1.28% accounts for a substantial 18.3% of the market return (See Malkiel (2013)). This increase in fees of the actively managed funds can be justified if funds outperform their respective benchmarks or at least the low-cost index funds. On the contrary, academic research suggests that actively managed funds with higher fees tend to underperform the market as well as low-cost index funds (Gil-Bazo and Ruiz-Verdu (2009); Ferreira et al (2013); Vidal et al. (2015)). These research findings are corroborated by a recent regulatory report on the UK asset management industry (see FCA Report (2017)).

Since fund fees are set by fund management companies themselves, one would assume that fund fees would decrease with the level of competition. Coates and Hubbard (2007) argue that "the mutual fund industry is a classic, competitively structured industry, with hundreds of competing firms offering thousands of products, low barriers to entry and firm expansion, and low concentration". Various reports from the Investment Company Institute ((2010), (2014) etc.) emphasize that fund expense ratios are continuously decreasing and the economy of scale from the huge recent growth in the assets under management is being passed on to small investors. Others claim that market competition is not enough to

significantly influence fund fees. The United States General Accounting office ((2000)[4], (2003)[5]) argues that "although hundreds of fund advisers offering thousands of mutual funds compete actively for investor dollars, their competition is not primarily focused on the fees". Freeman and Brown (2001) claim that fund management companies pass few of the savings accruing from economies of scale to their clients. There have been many lawsuits alleging that fund trustees breached their fiduciary duties towards retail investors by approving excessive fees (see Murphy (2005)). In his recent annual letter to Berkshire Hathaway shareholders, Warren Buffett wrote "when trillions of dollars are managed by Wall Streeters charging high fees, it will usually be the managers who reap outsized profits, not the clients." Thus, it is not clear whether the mutual fund market is price competitive or not.

In this paper, we take the negative of the style-market Herfindahl-Hirschman index as a proxy for market competition and study its impact on fund fees. If the market is price competitive, we should find a negative relation between competition and fund fees[6]. Using a sample of US domestic equity funds from 2000 to 2015, we find a rather surprising result: funds operating in more competitive market segments charge significantly higher annual expense ratios than funds operating in less competitive market segments. This finding is robust in different econometric models and withstands various other robustness tests. In addition, we find that front load fees, the one-time commission paid by investors on purchase of fund share, are positively associated (though insignificantly) with competition.

[4] Report to the Chairman, Subcommittee on Finance and Hazardous Materials; and the Ranking Member, Committee on Commerce, House of Representatives, June 2000.
[5] Testimony before the subcommittee on Capital Markets, Insurance and Government Sponsored Enterprises, Committee on Financial Services, House of Representatives.
[6] Mutual fund fees are generally of two types –1. fees that reflect costs incurred in a particular transaction such as front load fee and 2. fees that reflect recurring fund operating costs such annual expense ratios.

This suggests that the total cost of fund ownership (the load fees plus the annual expense ratios) is increasing with competition, i.e., fund managers are not competing on price.

Next, we study the channels behind this surprising positive relation between competition and expense ratio. We study the impact of competition on the three major components of annual expense ratios: 1. investment advisory fees, also called management fee, 2. marketing and distribution expenses, captured by 12b1 fee, and 3. other fees, which comprises of brokerage, custodial, transfer agency, legal, and accountants' fees etc.[7] It is possible that funds operating in more competitive markets incur higher costs of operations and pass these costs on to investors as higher annual expense ratios. For example, funds may have to spend more money on marketing and distribution activities to stay competitive. Contrary to this view, we find that funds decrease 12b1 fees as well as other fees (though not significantly) when they operate in high competition market segments.

On further examination, we find that the positive relation between competition and expense ratio is solely driven by significant increase in management fees with competition. We consider two plausible explanations. First, it is possible that funds operating in more competitive markets offer higher compensation to attract skilled managers, spend more on research and development activities, and pass on these additional expenses to shareholders in the form of higher management fee, which increases the expense ratio. If this cost based hypothesis is true, larger funds should take advantage of the economy of scale and their fees should be less positively associated with competition. However, we find evidence to the contrary: fees for the larger funds exhibit even a stronger positive relation with

[7] More details can be found on the SEC website (https://www.sec.gov/fast-answers/answersmffeeshtm.html).

competition. These results suggest that the higher expense ratios in more competitive markets are not likely caused by higher costs of fund operations in those markets.

We then explore if there is a strategic explanation on why fees should go up with competition. Christoffersen and Musto (2002) find that mutual funds that face a relatively inelastic demand curve charge higher fees. They argue that funds with worse past performance face a relatively inelastic demand curve and charge higher fees as performance-sensitive investors leave these funds following bad performance. Pastor, Stambaugh and Taylor (2015) find that fund performance decreases with the level of industry competition. Their hypothesis is motivated by liquidity constraints- "in a more crowded industry, there are likely to be more active funds chasing the same investment opportunities and pushing prices in the same direction". In a sample of mutual funds in the UK, Keswani and Stolin (2006) find that fund performance is less persistent in more competitive segments. We follow their methodology and find similar results using our US sample. Together, these findings support the narrative that fund performance and performance persistence decrease in more competitive markets and this drives performance sensitive investors away, leaving behind relatively less performance sensitive investors in the more competitive segments. Hence, fund managers operating in more competitive segments take advantage of it by increasing management fees. We further test this strategic fee setting hypothesis against the alternative cost based hypothesis, and find evidence in support of the former.

Our paper contributes to the literature in several aspects. First, to the best of our knowledge, it is the first paper to establish a direct link between market competition and mutual fund fees and thus adds to a growing literature on fund market competition (Coates

and Hubbard (2007), Freeman and Brown (2001), Murphy (2005), Pastor, Stambaugh and Taylor (2015) etc.). Furthermore, by suggesting that market competition on its own may not be sufficient to decrease funds fees, our study has important policy implications that regulatory interventions targeted at encouraging competition or lowering entry barriers may not be able to bring down the fund fees; whereas interventions targeted at making small investors more aware of the fund fees may help as it will make them more sensitive towards net performance of asset management funds.

Second, our paper adds to the earlier works on determinants of mutual fund fees such as Malhotra and McLeod (1997), Christoffersen and Musto (2002), Barber, Odean and Zheng (2005), Gil-Bazo and Ruiz-Verdu (2008), Khorana, Servaes, and Tufano (2009), and Han, Kang and Won (2013). The paper closest to ours is Gil-Bazo and Ruiz-Verdu (2009). They find a negative relation between before-fee performance and fund fees, and argue that it is an outcome of strategic fee setting by mutual funds in the presence of investors with different degrees of sensitivity to performance: low-performing funds charge higher fees to the relatively less sophisticated, less performance sensitive investors. Our findings are similar- funds strategically increase fees in high competition markets in the presence of relatively less performance sensitive investors.

Third, our paper also sheds some light on how competition adversely affects fund performance persistence in the US fund market. Our findings echo an UK study by Keswani and Stolin (2006), and adds to a long list of earlier works on performance persistence such as Brown and Goetzmann (1995), Carhart (1997), Ibbotson and Patel (2002), Teo and Woo (2001), Wermers (2003) and Vidal-Garcia et al (2016).

Our analysis is at the fund style class level and hence, one concern is that our results may be driven by omitted variables which are specific to style classes. To address this, we include relevant style-class level control variables and our results are robust. In addition, our results survive a fund fixed effects model, though the effect of competition on fees becomes less pronounced. The weaker effect found in the fixed effect model maybe due to the fact that funds follow long-term fee strategies and there are adjustment costs to switch between two fee structures. Consistent with this view, we find that the fee-competition relation is significantly more pronounced for younger funds whose fee structures reflect relatively recent competition levels, i.e., newly-established funds in more competitive fund classes charge higher fees compared to established funds.

To further address concerns over style-class specific omitted variables, we examine fund fees before and after the 2008 financial crisis, around which many fund segments experienced a significant, unexpected shock to competition. We find that fees in a few segments with increased post-crisis competition levels increased significantly after the crisis, compared to other segments in which competition remained unchanged or decreased. As the change in competition in these market segments is caused by an unexpected financial crisis, it helps identify the positive effect of competition on fund fees.

The rest of the paper is structured as follows: Section 2 describes the data and summary statistics; Section 3 presents the methodology and empirical analysis; Section 4 concludes.

2. Data and Summary Statistics

We draw a sample of open-end US domestic equity mutual funds between 2000 and 2015 from the CRSP Mutual Fund Database. The CRSP mutual fund

database provides information on fund returns, total net assets, fund fees, investment objectives, and other fund characteristics.[8]

We calculate the Herfindahl-Hirschman index (HHI) for each Lipper class market segment, following studies such as Ferreira et al. (2013) and In et al. (2014). Since a greater HHI means more assets concentration and reflects less competition within the segment, we use the negative of HHI as our measure of competition within a Lipper class segment. We recognize that several funds from a single family of funds may coexist within a Lipper class and hence, we aggregate assets by family in a class to calculate our measure of competition:

$$Competition_{j,t} = -HHI_{j,t} = -\sum_{i=1}^{N_{j,t}} S_{i,j,t}^2 \qquad (1)$$

where $HHI_{j,t}$ is the Herfindahl-Hirschman index of Lipper class j in year t; $S_{i,j,t}$ is the total net assets of fund family i in Lipper class j in year t, divided by the total net assets of all funds operating in the Lipper class; $N_{j,t}$ is the number of fund families in Lipper class j in year t.

Table 1 reports descriptive statistics of our sample by Lipper class. There is a large variation in the number of observations in each Lipper class; for example, MTAA has only 112 observations[9], whereas LCCE has more than 9,000 observations. The median number of funds in a Lipper class is 441. We also observe variations in size (total net assets) and fees across the classes. The names and descriptions of these Lipper Classes are included in Appendix B.

[8] We drop a few observations with negative expense ratios as these may be due to data errors.
[9] Excluding classes with less than 300 observations in fact improves our empirical results.

Table 1: **Descriptive Statistics by Lipper Class***

Lipper Class	*Num. of Obs.*	*Avg. Size (TNA)*	*% Mgmt Fee*	*% Expense Ratio*	*% 12B1 Fee*	*HHI*
EIEI	2,944	829.755	0.641	1.247	0.584	0.122
FS	1,048	271.275	0.679	1.404	0.624	0.255
H	1,394	459.060	0.761	1.529	0.640	0.201
LCCE	9,109	839.046	0.600	1.189	0.580	0.134
LCGE	7,635	845.525	0.680	1.306	0.570	0.085
LCVE	5,102	1037.187	0.597	1.185	0.569	0.158
MCCE	3,557	646.343	0.669	1.191	0.503	0.123
MCGE	4,951	385.105	0.765	1.428	0.561	0.056
MCVE	2,601	462.519	0.747	1.366	0.566	0.134
MLCE	7,096	822.790	0.597	1.189	0.573	0.214
MLGE	5,175	951.409	0.695	1.376	0.589	0.207
MLVE	4,340	546.808	0.670	1.282	0.585	0.078
MTAA	112	245.190	0.187	0.707	0.539	0.084
MTAG	169	231.044	0.183	0.880	0.729	0.227
NR	904	359.335	0.637	1.289	0.571	0.161
SCCE	6,575	386.323	0.762	1.303	0.514	0.063
SCGE	5,277	265.833	0.834	1.495	0.541	0.055
SCVE	3,145	301.252	0.812	1.391	0.544	0.071
TK	2,189	356.132	0.806	1.666	0.644	0.089
UT	992	346.945	0.601	1.323	0.616	0.116
Total	74,356	641.781	0.689	1.309	0.569	0.122

*Note: This table reports the number of observations, mean total net assets, annual expense ratio, 12b1 fees and Herfindahl index for the Lipper class market segments. Definitions of the variables are included in Appendix A.

We include the following fund level control variables in our analysis: Fund Performance (calculated from CRSP: mret), natural logarithm of Fund Age (calculated from CRSP: first_offer_dt and caldt), natural logarithm of fund Total Net Assets (calculated from CRSP: mtna), fund Return Volatility (calculated from CRSP: mret), Fund Flow (calculated from CRSP: mret and mtna) and Turnover Ratio (CRSP: turn_ratio). In addition to the fund-level controls, we also include family-level (CRSP: mgmt_cd) and class-level(CSRP: lipper_class) control variables such as natural logarithm of Family Net

Assets, Class Flow, Class Performance, and natural logarithm of Number of Funds in a class. Definitions of the variables are presented in the Appendix A.

Table 2 reports descriptive statistics of our key variables, at the fund-year level, in Panel A and the correlation coefficients between the key variables in Panel B.

Table 2: Key Variables*

Panel A. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Median	Max
12b1 Fee (%)	42790	0.569	0.362	0.000	0.489	1.129
Management Fee (%)	72772	0.689	0.270	0.000	0.706	4.614
Expense Ratio (%)	74192	1.309	0.575	0.000[10]	1.250	8.890
Other Fee (%)	41892	0.335	0.247	0.000	0.290	6.986
Competition	67610	-0.121	0.072	-0.023	-0.102	-0.452
Fund Performance	72515	0.091	0.231	-0.798	0.111	3.139
Log(Fund Age)	74349	4.417	0.896	0.000	4.522	6.989
Log(Total Net Assets)	73532	4.653	1.760	1.629	4.470	11.678
Return Volatility	72301	0.047	0.024	0.001	0.042	0.326
Fund Flow	67104	0.225	1.588	-1.479	-0.038	104.267
Turnover Ratio	72319	0.827	1.210	0.000	0.600	60.700
Family Net Assets	74349	9.484	2.210	-0.916	9.836	14.447
Class Flow	71404	3.826	1.001	-2.432	4.011	5.755
Class Performance	74356	0.097	0.215	-0.473	0.118	1.191
Number of Funds	63285	5.844	0.603	3.045	5.951	6.682

*Note: This table reports descriptive statistics, number of observations, mean, standard deviation, minimum, median and maximum of the key variables used in this study. Variable description are included in Appendix A.

[10] These numbers are positive, but smaller than 0.0005%, and hence, are rounded down to zero. The small numbers probably reflect special offers and discounts.

Panel B. Correlation Matrix

This panel reports the correlation between key variables in the study. Some of the variable names have been shortened in the interest of space. Variable description are included in Appendix A.

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13
Exp Ratio	1	1.00												
12b1 Fee	2	0.66	1.00											
Mgmt Fee	3	0.52	-0.02	1.00										
Other Fee	4	0.52	0.05	-0.08	1.00									
Front Load	5	-0.41	-0.71	0.06	0.02	1.00								
Competition	6	0.08	-0.03	0.13	0.05	0.01	1.00							
Performance	7	-0.07	-0.02	0.03	-0.14	-0.01	-0.02	1.00						
Log(Age)	8	-0.28	-0.13	-0.15	-0.21	0.05	-0.06	0.05	1.00					
Log(TNA)	9	-0.49	-0.26	-0.23	-0.35	0.18	-0.06	0.07	0.49	1.00				
Volat	10	0.14	-0.01	0.08	0.20	0.02	0.15	-0.34	-0.13	-0.07	1.00			
Ret Vol.	11	-0.02	-0.02	0.02	-0.03	0.03	0.01	0.09	-0.14	0.03	-0.01	1.00		
Turnover	12	0.20	-0.02	0.18	0.20	0.04	0.06	-0.05	-0.11	-0.18	0.23	0.02	1.00	
No of Funds	13	-0.12	-0.05	-0.07	-0.09	0.04	0.13	-0.05	0.10	0.06	-0.11	-0.03	-0.02	1.00

In Table 2, we observe a big dispersion in fund Expense Ratio (CRSP: exp_ratio) and its components: Management Fee (CRSP: mgmt._fee), 12b1 Fee (CRSP: actual_12b1) and Other Fee (calculated from CRSP: exp_ratio, mgmt_fee and actual_12b1). We find that our competition measure is not highly correlated with the number of funds in each segment[11].

3. Methodology and Empirical Analysis

In this section, we describe our empirical methodology and report our findings. We first analyze the relation between competition and fund fees, and then investigate plausible explanations behind this relation. Then, we discuss the robustness of our results, and report changes in competition and fund fees around an exogenous shock – the 2008 financial crisis – to corroborate our findings.

3.1 Impact of Competition on Expense Ratio

In this section, we study the impact of competition on mutual fund fees. We regress fund expense ratios on competition. We include control variables described in Section 2. Since ours is a typical finance panel data set at the fund-year level, we start with an OLS regression with year fixed effects and clustered standard errors:

$$Expense\ Ratio_{i,t} = \beta_1 Competition_{j,t-1} + \beta_2 Fund\ Performance_{i,t-1} + \beta_3 Log(Fund\ Age_{i,t-1}) + \beta_4 Log(Total\ Net\ Assets_{i,t-1}) + \beta_5 Return\ Volatility_{i,t-1} + \beta_6 Fund\ Flow_{i,t-1} + \beta_7 Turnover_{i,t-1} + \beta_8 AdditionalControls_{i,t-1} + \beta_9 YearDummy_t + \varepsilon_{i,t} \quad (2)$$

[11] Though Competition exhibits high correlation coefficients with some control variables, we find very small VIFs in our regressions (usually smaller than 2), suggesting that our results are not affected much by multi-collinearity.

To test robustness of our results, we use a fixed effects model and a Fama-MacBeth model. We also substitute our continuous measure of competition with discrete measures. We report the coefficient estimates of eq (2) in Table 3. A detailed list of variable definitions is included in Appendix A. We include year fixed effects and cluster standard errors at the fund level.

Table 3: **Impact of Competition on Fund Expense Ratio***

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent Variable: Expense Ratio					
	OLS	OLS	OLS	Family FE	Fund FE	FMB
Competition	0.191***		0.192***	0.241***	0.030**	0.157**
	(3.06)		(2.98)	(4.48)	(1.97)	(2.21)
High Comp		0.034***				
		(3.68)				
Fund Performance	-0.090***	-0.253***	-0.253***	-0.201***	-0.041*	-0.644***
	(-4.38)	(-7.99)	(-7.99)	(-7.05)	(-1.85)	(-4.24)
Log(Fund Age)	0.135***	0.134***	0.133***	0.064***	0.013***	0.115***
	(19.78)	(19.62)	(19.54)	(9.76)	(3.07)	(4.67)
Log(Total Net Assets)	-0.150***	-0.145***	-0.145***	-0.108***	-0.025***	-0.137***
	(-47.97)	(-44.62)	(-44.63)	(-36.34)	(-15.51)	(-24.88)
Return Volatility	3.463***	3.344***	3.392***	2.531***	-0.246	2.535***
	(11.78)	(11.99)	(12.00)	(9.96)	(-1.44)	(3.12)
Fund Flow	-0.006***	-0.005***	-0.005***	-0.009***	-0.001*	-0.011**
	(-4.00)	(-3.22)	(-3.26)	(-5.73)	(-1.96)	(-2.44)
Turnover Ratio	0.048***	0.049***	0.049***	0.031***	0.007***	0.049***
	(6.80)	(6.56)	(6.56)	(5.45)	(3.05)	(7.23)
Family Net Assets		-0.009***	-0.009***	0.003	-0.024***	-0.009**
		(-3.18)	(-3.23)	(0.47)	(-6.21)	(-2.75)
Class Flow		-0.013***	-0.012***	-0.013***	-0.004***	0.004
		(-3.34)	(-3.10)	(-4.30)	(-5.20)	(0.36)
Class Performance		0.349***	0.343***	0.303***	-0.013	0.478**
		(7.73)	(7.62)	(8.15)	(-0.76)	(2.59)
Number of Funds		-0.017*	-0.020**	-0.042***	-0.006	-0.046**
		(-1.66)	(-1.97)	(-4.86)	(-1.37)	(-2.70)
Constant	1.411***	1.544***	1.566***	1.919***	1.654***	1.593***
	(43.91)	(22.93)	(23.02)	(29.98)	(34.11)	(9.91)
Observations	60,601	54,276	54,276	54,276	54,276	54,276
R-squared	0.267	0.270	0.270	0.511	0.135	0.263

*Note: This table reports results of regressions with annual expense ratio as the dependent variable. Definitions of the variables are included in Appendix A. Year fixed effects are included. All standard errors are clustered at the fund level. Robust t-statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

To avoid any chance of endogeneity that may be caused by contemporaneous independent variables, the independent variables are measured at the beginning of year so that all independent variables are observed prior to the mutual fund fees (which is measured at the end of the year). The first column in table 3 reports results from a pooled regression. Consistent with the view that competition is not sufficient to drive down mutual fund fees (United States General Accounting office (2003)) and contrary to Coates and Hubbard (2007), the positive coefficient on Competition is economically and statistically significant (at the 1% level). We replace the continuous Competition measure with a dummy variable, High Comp, which equals 1 when a Lipper class's Competition is in the top half of the sample, and 0 otherwise. Columns 2 reports results from this regression. Again, we find that the positive coefficient on High Comp is economically and statistically significant (at the 1% level), i.e., a fund operating in the top half of the competition segments is charging 3.4 basis points higher expense ratio.

We measure competition at the fund class level and hence, it may be a concern that the results are driven by style-market specific omitted variables. To address this we add style class level control variables to the regression in column 3. We find similar results to those in the earlier regression without the style class level control variables.

Management companies manage a number of funds and hence, the results could potentially be influenced by differences across the management companies. To capture the time-invariant differences across management companies, we include management company fixed effects in the regression and report the results in column 4. We find that the positive coefficient on Competition has in fact become more pronounced.

The positive relation between fee and competition may also be influenced by unobserved fund characteristics. To control for this time-invariant unobserved

heterogeneity, we estimate the fee equation with fund fixed effects and report the results in column 5. We find that the coefficient on Competition is positive and significant at the 5% level, however, its magnitude has become smaller. This smaller coefficient suggests that funds tend to follow long-term fee strategies or there is a switching cost associated with a change in fee structure. This makes fund fees sticky. In column 6, we report results of a Fama-MacBeth regression. We find that the coefficient on the Competition variable is significant at the 5% level.

Our models have large R^2, similar in size to those reported in Christoffersen and Musto (2002). In all these regressions, we find that the coefficients of Log (Fund Age) and Log (Total Net Assets) have consistently positive and negative signs respectively. This suggests that younger funds and larger funds charge lower fees. Funds with higher return volatility and higher turnover ratios tend to charge higher fees. We also find a negative association between fund flow and fund fees.

The findings in table 3 suggest that a fund charges a higher, rather than a lower, annual expense ratio when it's operating in a more competitive segment. This contradicts previously held views that mutual funds compete on fees (Coates and Hubbard (2007), Investment Company Institute ((2010) and (2014)).

Annual expense ratio does not include one-time transaction fees such as load fees. It is possible that total cost of fund ownership, which includes load fees in addition to annual expense ratio, decreases with competition. However, we find that it is not the case. Column 1 in table 4 reports results of a regression of front load fee (the one time transaction fee paid by the investors on purchase of fund shares) on Competition. The sign on the coefficient of Competition is positive (as was the case for expense ratio in table 3), though

it is not statistically significant. This suggests that the total cost of fund ownership is higher for funds operating in more competitive segments.

3.2 Impact of Competition on Mutual Fund Fee Components

Next, we investigate what makes competition positively correlated with expense ratio. We consider two possible hypotheses: the cost based hypothesis and the strategic fee setting hypothesis. The cost based hypothesis proposes that funds operating in more competitive markets incur higher costs and pass these costs on to the investors; whereas the strategic fee setting hypothesis proposes that performance and performance persistence of funds are lower in more competitive markets and hence, performance sensitive investors move out of these segments. This leaves only relatively performance insensitive investors in more competitive segments, which makes the demand curve relatively inelastic, and funds take advantage of it by increasing their management fees.

We have already controlled for variables that likely determine operating costs of a fund such as fund age, fund size, turnover ratio (see results reported in table 3). These do not explain all of the variations in the expense ratio and the coefficient on Competition is significant at the 1% level. It suggests that the cost based hypothesis is unable to entirely explain the positive relation between competition and expense ratio. To investigate this further, we examine the components of expense ratio - 12b1 Fee (which reflects marketing and distribution expenses), Management Fee (fees that are paid to the fund's investment adviser for managing the fund's investment portfolio), and Other Fees (which reflects expenses not included in Management Fee and 12b1 Fee, such as custodial expenses, legal expenses etc.). We regress these fee components on Competition in eq (3):

$$Fee\ Components_{i,t} = \beta_1 Competition_{j,t-1} + \beta_2 Fund\ Performance_{i,t-1} + \beta_3 Log(Fund\ Age_{i,t-1}) + \beta_4 Log(Total\ Net\ Assets_{i,t-1}) + \beta_5 Return\ Volatility_{i,t-1} + \beta_6 Fund\ Flow_{i,t-1} + \beta_7 Turnover_{i,t-1} + \beta_8 AdditionalControls_{i,t-1} + \beta_9 YearDummy_t + \varepsilon_{i,t} \quad (3)$$

where $Fee\ Component_{i,t}$ is a mutual fund's 12b1 Fee, Management Fee or Other Fees. We include the same control variables as in the previous regressions and cluster standard errors at the fund level. The coefficient estimates are reported in columns 2-4 in Table 4.

Table 4: **Competition and Mutual Fund Fee Components**

Dep. Var:	(1) Front Load	(2) 12b1 Fee	(3) Other Fees	(4) Management Fee
Competition	0.467	-0.214***	-0.039	0.394***
	(0.73)	(-3.66)	(-1.31)	(12.63)
Fund Performance	-0.059	-0.152***	-0.145***	0.070***
	(-0.26)	(-6.23)	(-7.71)	(4.64)
Log(Fund Age)	-0.353***	0.043***	0.015***	0.022***
	(-4.54)	(5.75)	(4.12)	(6.53)
Log(Total Net Assets)	0.167***	-0.087***	-0.037***	-0.007***
	(3.92)	(-27.65)	(-22.93)	(-4.09)
Return Volatility	-3.574	0.014	2.071***	1.890***
	(-1.56)	(0.06)	(12.62)	(13.72)
Fund Flow	0.030***	-0.008***	-0.004***	0.001*
	(2.82)	(-3.75)	(-3.23)	(1.95)
Turnover Ratio	0.150**	-0.013***	0.028***	0.034***
	(2.48)	(-3.22)	(5.46)	(7.77)
Family Net Assets	-0.062*	0.040***	-0.020***	-0.049***
	(-1.82)	(14.93)	(-9.74)	(-34.04)
Class Flow	-0.083**	0.012***	-0.015***	-0.013***
	(-2.42)	(3.53)	(-7.49)	(-7.50)
Class Performance	-0.054	0.089**	0.140***	0.107***
	(-0.16)	(2.41)	(5.48)	(5.29)
Number of Funds	0.294***	-0.004	-0.008*	-0.017***
	(2.86)	(-0.43)	(-1.91)	(-3.96)
Constant	4.143***	0.488***	0.580***	1.100***
	(5.76)	(7.46)	(17.44)	(34.65)
Observations	14,603	31,457	30,947	53,531
R-squared	0.020	0.151	0.246	0.239

* Note: This table reports results of regressions with frontload and components of annual expense ratios (12b1 Fee, Other Fees and Management Fee) as dependent variables. Definitions of the variables are included in Appendix A. Year fixed effects are included. All standard errors are clustered at the fund level. Robust t-statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

If the cost-based hypothesis is true, we should observe positive coefficients on Competition variable. We find that 12b1 Fee in column 2 goes down with competition[12], whereas Other Fees in column 3 do not change with competition. These results are again not consistent with the cost based hypothesis. However, Management Fee results in column 4 are consistent with both the cost based hypothesis: a fund may have to spend more on due diligence and pay more to higher-quality managers in order to survive in a more competitive segment, and the strategic fee setting hypothesis: funds face a relatively inelastic demand curve in more competitive markets and take advantage of it by increasing their management fees. The Management Fee results are more economically significant than the expense ratio results: we find that funds in the top half competition segments charge 6 basis points higher management fees compared to funds in the bottom half competition segments.

To further examine if the cost based hypothesis or the strategic fee setting hypothesis explains the results better, we next consider the impact of fund size and fund age on the relation between management fees and competition.

3.3 Competition, Fund Size and Fund Age

Under the framework of the cost based hypothesis, the positive relation between management fee and competition should be weaker for larger funds as they enjoy economy

[12] This is somewhat counter intuitive, however it could be explained by the following: marketing and distribution efforts help top performing mutual funds attract investments in a tournament-like mutual fund market, where superior performance is rewarded with convex new investments (Capon, Fitzsimons, and Prince (1996), Sirri and Tufano (1998), Gallaher, Kaniel, and Starks (2005), Gualtieri and Petrella (2005), Korkeamaki, and Puttonen, Smythe (2007)). In more competitive segments, the chances of achieving or repeating top performances goes down and this reduces the incentive to spend more money on marketing and distribution activities (see Carlin, Davies and Iannaccone, (2012) and Pastor, Stambaugh and Taylor (2015).

of scale, whereas the strategic fee setting hypothesis suggests that the fee-competition relation should vary by fund age. Fee structure decisions are long term in nature, which makes the fees rather sticky and hence, younger funds are better able to design fees to cater to the recent levels of competition. Thus, the fee-competition relation should be more pronounced for younger funds. We regress Management Fee on Competition, dummy variables for large and young funds, and their interactions with Competition:

$$Mgmt\ Fee_{i,t} = \beta_1 Competition_{j,t-1} + \beta_2 LargeFund_{i,t-1} + \beta_3 Competition_{j,t-1} \times LargeFund_{i,t-1} + \beta_4 Fund\ Performance_{i,t-1} + \beta_5 Log(Fund\ Age_{i,t-1}) + \beta_6 Log(Total\ Net\ Assets_{i,t-1}) + \beta_7 Return\ Volatility_{i,t-1} + \beta_8 Fund\ Flow_{i,t-1} + \beta_9 Turnover_{i,t-1} + \beta_{10} AdditionalControls_{i,t-1} + \beta_{11} YearDummy_t + \varepsilon_{i,t} \quad (4)$$

and

$$Mgmt\ Fee_{i,t} = \beta_1 Competition_{j,t-1} + \beta_2 YoungFund_{i,t-1} + \beta_3 Competition_{j,t-1} \times YoungFund_{i,t-1} + \beta_4 Fund\ Performance_{i,t-1} + \beta_5 Log(Fund\ Age_{i,t-1}) + \beta_6 Log(Total\ Net\ Assets_{i,t-1}) + \beta_7 Return\ Volatility_{i,t-1} + \beta_8 Fund\ Flow_{i,t-1} + \beta_9 Turnover_{i,t-1} + \beta_{10} AdditionalControls_{i,t-1} + \beta_{11} YearDummy_t + \varepsilon_{i,t} \quad (5)$$

where $Mgmt\ Fee_{i,t}$ is the management fee of Fund i in Year t. A negative sign on the interaction term in 4 above would support the cost based hypothesis, whereas a positive sign on the interaction term in 5 above would support the strategic fee setting hypothesis. We report the results in table 5.

Table 5: **Competition, Fund Size and Fund Age**

	(1)	(2)
Dep. Var.:	Management Fee	Management Fee
Competition	0.340***	0.288***
	(10.43)	(7.57)
Large Fund	0.022*	
	(1.89)	
Young Fund		0.012
		(1.42)
Competition*Large Fund	0.329***	
	(4.34)	
Competition*Young Fund		0.263***
		(4.97)
Fund Performance	0.068***	0.069***
	(4.55)	(4.60)
Log(Fund Age)	0.022***	0.011**
	(6.68)	(2.40)
Log(Total Net Assets)	-0.004**	-0.007***
	(-2.08)	(-4.01)
Return Volatility	1.901***	1.857***
	(13.83)	(13.56)
Fund Flow	0.001*	0.001*
	(1.74)	(1.94)
Turnover Ratio	0.034***	0.034***
	(7.78)	(7.74)
Family Net Assets	-0.049***	-0.049***
	(-33.79)	(-34.15)
Class Flow	-0.013***	-0.013***
	(-7.70)	(-7.81)
Class Performance	0.108***	0.107***
	(5.37)	(5.35)
Number of Funds	-0.018***	-0.016***
	(-4.17)	(-3.75)
Constant	1.084***	1.140***
	(33.95)	(32.32)
Observations	53,520	53,531
R-squared	0.241	0.241

* Note: This table reports results of regressions with Management Fee as dependent variables. Definitions of the variables are included in Appendix A. Year fixed effects are included. All standard errors are clustered at the fund level. Robust t-statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

In column 1 of table 5, Large Fund is a dummy variable which equals 1 if the fund size (total fund net assets) is greater than or equal to the average size in the Lipper class, and 0 otherwise. In contrast to the predictions of the cost based hypothesis, we find that the coefficients of Competition and the interaction term are 0.340 and 0.329, respectively, suggesting that the effect of competition is almost twice as big for larger funds. Hence, it

is unlikely that the cost based hypothesis can explain the positive relation between competition and expense ratio.

In column 2 of table 5, Young Fund is a dummy variable which equals 1 if fund age is lower than or equal to the average fund age in the Lipper class, and 0 otherwise. We find that, as was the case for the Large Funds, the positive effect of competition on Management Fee is almost twice as big for younger funds (the coefficients of Competition and the interaction term are 0.288 and 0.263 respectively). This is consistent with the hypothesis that funds strategically set higher management fees to target less fee-sensitive investors.

3.4 Competition, Fund Performance and Performance Persistence

Pastor, Stambaugh and Taylor (2015) find that performance of funds goes down with the level of industry competition. Keswani and Stolin (2006) find a negative relation between competition and fund performance persistence using mutual funds data in the UK. In this section, we study if a similar relation between competition and performance persistence exists in the US fund markets.

Following Keswani and Stolin (2006), we define two measures of fund performance persistence: the log odds ratio and the Spearman correlation coefficient. For the log odds ratio we first construct 2-by-2 winner and loser contingency tables based on their past performance (performance above class median makes a winner, below class median makes a loser), then the log odds ratio is estimated as

$$Persistence\_or_{j,t} = \ln\left(\frac{WW_{j,t} * LL_{j,t}}{WL_{j,t} * LW_{j,t}}\right) \quad (6)$$

where $WW_{j,t}$, $LL_{j,t}$, $WL_{j,t}$and $LW_{j,t}$ are the number of funds in the Lipper class which fall in each of the winner or loser cells. For the Spearman correlation coefficient, we first calculate the number of funds that existed in years t and t+1 (N), and define the correlation coefficient as:

$$Persistence\_rs_{j,t} = 1 - 6 * (\sum_{i=1}^{N} d_i)/(N^3 - N) \quad (7)$$

where d_i is the rank difference of fund I between years t and t+1. Persistence_or and Persistence_rs thus reflect the performance persistence of funds in a Lipper class j in year t. If competition leads to less consistent fund performance in the market segment, we should expect negative coefficients on Competition in the following regression, using both persistence measures:

$$Persistence_{i,t} = \beta_1 Competition_{j,t-1} + \beta_2 Fund\ Performance_{i,t-1} +$$
$$\beta_3 Log(Fund\ Age_{i,t-1}) + \beta_4 Log(Total\ Net\ Assets_{i,t-1}) + \beta_5 Return\ Volatility_{i,t-1} +$$
$$\beta_6 Fund\ Flow_{i,t-1} + \beta_7 Turnover_{i,t-1} + \beta_8 AdditionalControls_{i,t-1} +$$
$$\beta_9 YearDummy_t + \varepsilon_{i,t} \quad (8)$$

We report the coefficient estimates in table 6. We use the spearman correlation coefficient (Persistence_rs) as the dependent variable in column 1, and the log odds ratio (Persistence_or) as the dependent variable in column 2. We include the same control variables as reported in Tables 3-5. Year fixed effects are included but suppressed; standard errors are clustered at the fund level.

Table 6: **Competition and Mutual Fund Performance Persistence**

Dep. Var.:	(1) Persistence_rs	(2) Persistence_or
Competition	-0.071***	-0.299***
	(-5.35)	(-6.16)
Fund Performance	0.020	0.039
	(1.47)	(0.76)
Log(Fund Age)	-0.002	-0.007
	(-1.60)	(-1.43)
Log(Total Net Assets)	0.000	0.001
	(0.15)	(0.53)
Return Volatility	-0.640***	-2.648***
	(-9.11)	(-9.26)
Fund Flow	0.000	0.001
	(0.49)	(0.54)
Turnover Ratio	-0.001	0.005
	(-0.73)	(1.44)
Family Net Assets	-0.001*	-0.002
	(-1.80)	(-1.40)
Class Flow	-0.007***	-0.029***
	(-6.90)	(-7.41)
Class Performance	-0.111***	-0.346***
	(-4.95)	(-3.80)
Number of Funds	-0.008***	0.012
	(-4.08)	(1.47)
Constant	-0.110***	-0.330***
	(-7.76)	(-5.99)
Observations	50,253	50,253
R-squared	0.577	0.471

* Note: This table reports results of regressions with two measures of performance persistence as dependent variables. Definitions of the variables are included in Appendix A. Year fixed effects are included. All standard errors are clustered at the fund level. Robust t-statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 6 reveals negative associations between persistence measures and Competition. In general, our findings are consistent with those in Keswani and Stolin (2006). These results are both statistically and economically significant: differences in the two persistence measures between a fund in the bottom 20% competition segment and a fund in the top 20% competition segment are 0.018 and 0.064, while the medians of the two persistence measures are 0.047 and 0.087. The models have R^2 of more than 40%, greater than the R^2

reported in Keswani and Stolin (2006). These results along with the performance results of Pastor, Stambaugh and Taylor (2015) suggest that the decrease in fund performance and performance persistence in competitive markets can be a channel between competition and management fee: it drives performance sensitive investors out of the segments, leaving only performance-insensitive investors. Facing a relatively inelastic demand curve, funds increase their management fees, which in turn increases the expense ratio.

3.5. Robustness Checks

In this section, we conduct a number of further tests to ensure that our results are robust. Specifically, we exclude some Lipper classes with particularly low fees, and consider additional factors such as multiple classes and attrition rates. We also consider alternative measures of competition, and discuss reverse causality. We show that our results are robust and withstand all these additional tests.

3.5.1 Mixed-assets Target Allocation Funds

We note that two mixed-assets target allocation fund classes in our sample – MTAA and MTAG – have particularly low average fees[13]. These two fund classes also have greater Herfindahl index values, indicating they are less competitive fund classes. In Table 7, we exclude these classes from our analysis and report the effect of Competition on fund fees. The dependent variables are Expense Ratio, 12b1 Fee, Management Fee, Other Fees and Front Load in columns 1-5 respectively.

[13] These are balanced funds mainly targeted at retirement.

Table 7. Impact of Competition on Fund Fees (sample excludes MTAA and MTAG)

Dep. Var.	(1) Expense Ratio	(2) 12b1 Fee	(3) Management Fee	(4) Other Fees	(5) Front Load
Competition	0.203***	-0.215***	0.401***	-0.038	0.460
	(3.13)	(-3.64)	(12.77)	(-1.26)	(0.71)
Fund Performance	-0.252***	-0.151***	0.070***	-0.145***	-0.056
	(-7.95)	(-6.19)	(4.63)	(-7.70)	(-0.25)
Log(Fund Age)	0.133***	0.043***	0.022***	0.015***	-0.346***
	(19.43)	(5.72)	(6.47)	(4.14)	(-4.43)
Log(Total Net Assets)	-0.145***	-0.087***	-0.007***	-0.037***	0.164***
	(-44.68)	(-27.60)	(-4.11)	(-22.93)	(3.85)
Return Volatility	3.308***	0.034	1.825***	2.066***	-3.448
	(11.69)	(0.15)	(13.25)	(12.59)	(-1.51)
Fund Flow	-0.005***	-0.008***	0.001*	-0.004***	0.030***
	(-3.24)	(-3.76)	(1.93)	(-3.23)	(2.83)
Turnover Ratio	0.048***	-0.012***	0.034***	0.028***	0.151**
	(6.49)	(-3.14)	(7.69)	(5.45)	(2.49)
Family Net Assets	-0.009***	0.040***	-0.049***	-0.020***	-0.061*
	(-3.22)	(14.92)	(-34.02)	(-9.71)	(-1.78)
Class Flow	-0.012***	0.012***	-0.013***	-0.015***	-0.083**
	(-3.11)	(3.49)	(-7.54)	(-7.49)	(-2.42)
Class Performance	0.326***	0.093**	0.094***	0.139***	-0.032
	(7.23)	(2.51)	(4.64)	(5.42)	(-0.10)
Number of Funds	-0.029***	-0.001	-0.024***	-0.008**	0.310***
	(-2.74)	(-0.10)	(-5.60)	(-2.03)	(2.93)
Constant	1.627***	0.469***	1.149***	0.584***	4.015***
	(23.30)	(6.91)	(36.39)	(17.27)	(5.44)
Observations	54,107	31,335	53,411	30,875	14,560
R-squared	0.270	0.151	0.240	0.246	0.020

* Note: This table reports results of regressions of expense ratio, its components and front load fee as dependent variables, using a data sample without the two Lipper class segments: MTAA and MTAG. Year fixed effects are included. All standard errors are clustered at the fund level. Robust t-statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

We find positive and significant coefficients of Competition in columns 1 and 3, and negative coefficient in column 2. In columns 4 and 5, the coefficients of Competition are insignificant. The magnitude and significance of these coefficients are very similar to those in Tables 3 and 4, indicating that our results are robust to exclusion of these two classes.

3.5.2 Multiple Share Classes

Adams, Mansi and Nishikawa (2012) find that mutual fund fees are significantly higher for funds which have multiple share classes. While our definition of competition is measured

at the fund family level and should not be biased by multiple share classes, our earlier results could be driven by the higher fees charged by multiple-class funds if they operate more in high-competition classes. We replicate our earlier results, including a fund's number of share classes as an additional control variable, and report our results in Table 8.

Table 8. Including Number of Share Classes as a Control Variable

	(1)	(2)	(3)	(4)	(5)
Dep. Var.	Expense Ratio	12b1 Fee	Management Fee	Other Fees	Front Load
Competition	0.154**	-0.194***	0.378***	-0.039	-0.007
	(2.41)	(-3.33)	(11.98)	(-1.29)	(-0.01)
Fund Performance	-0.262***	-0.158***	0.068***	-0.145***	-0.212
	(-8.26)	(-6.44)	(4.47)	(-7.67)	(-0.95)
Log(Fund Age)	0.118***	0.035***	0.013***	0.015***	-0.291***
	(16.57)	(4.51)	(3.69)	(3.87)	(-3.80)
Log(Total Net Assets)	-0.136***	-0.085***	-0.005***	-0.037***	0.134***
	(-41.07)	(-27.29)	(-2.95)	(-22.06)	(3.25)
Return Volatility	3.929***	0.254	1.940***	2.076***	-0.379
	(14.17)	(1.12)	(14.05)	(12.53)	(-0.17)
Fund Flow	-0.007***	-0.008***	0.001*	-0.004***	0.024***
	(-3.92)	(-3.74)	(1.73)	(-3.09)	(2.59)
Turnover Ratio	0.048***	-0.011***	0.034***	0.029***	0.174***
	(6.35)	(-2.69)	(7.52)	(5.37)	(2.91)
Family Net Assets	-0.031***	0.026***	-0.053***	-0.020***	-0.150***
	(-9.87)	(8.82)	(-33.36)	(-9.03)	(-4.54)
Class Flow	-0.017***	0.008***	-0.014***	-0.016***	-0.106***
	(-4.70)	(2.58)	(-7.90)	(-7.70)	(-3.16)
Class Performance	0.385***	0.109***	0.111***	0.143***	0.319
	(8.72)	(3.00)	(5.51)	(5.54)	(0.97)
Number of Funds	-0.042***	-0.011	-0.022***	-0.008*	0.193*
	(-4.27)	(-1.23)	(-5.08)	(-1.83)	(1.93)
Number of Classes	0.034***	0.020***	0.005***	0.001	0.198***
	(17.46)	(10.46)	(5.26)	(0.85)	(8.91)
Constant	1.717***	0.560***	1.170***	0.579***	4.155***
	(25.16)	(8.51)	(35.86)	(16.73)	(5.92)
Observations	52,669	30,852	51,991	30,369	14,453
R-squared	0.297	0.176	0.244	0.245	0.068

* Note: This table reports results of regressions of expense ratio, its components and front load fee as dependent variables, including the number of share classes as an additional control variable. Year fixed effects are included. All standard errors are clustered at the fund level. Robust t-statistics are reported in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

In Table 8, we report coefficient estimates using Expense Ratio, 12b1 Fee, Management Fee, Other Fees and Front Load as dependent variables in columns 1-5 respectively.

Overall, the results are very similar to those reported earlier; our results are also robust when we control for a dummy variable indicating whether a fund has multiple share classes or not.

3.5.3 Attrition Ratio

In addition to the commonly-used control variables, we also consider a fund's attrition ratio, which is closely related to investor sensitiveness and fund pricing (Christoffersen and Musto (2002)). In untabulated results, we use monthly total net assets data to replicate the attrition rate measure in Christoffersen and Musto (2002). We find a strong correlation (-61.3% and significant at the 1% level) between attrition rate and one of our existing control variable – fund performance. Our results are not affected when attrition ratio is included as an additional control variable.

3.5.4 Alternative Measures of Fund Competitiveness

We consider a number of different ways to measure fund class competition. Specifically, we consider using the inverse of the Herfindahl index, or (the negative of) the log, squared, or square root of the Herfindahl index as alternative measures of competition. In untabulated results, we find that these alternative measures of competition do not change our results.

Despite the popularity of the Herfindahl index, a number of other measures have been used to proxy for competition in other studies. For example, Peress (2010) uses the price-cost margin to measure a firm's market power in an industry. This, however, does not fit our setting because fund fees (equivalent to product prices) are our dependent variables.

Wahal and Wang (2011) and Cremers et al (2016) use the overlap in portfolio holdings as a measure of competitive intensity, but the measure is more suitable for fund pairs rather than for a segment-level study. We finally consider the number of funds as an alternative competition measure. While more funds in a segment to some extent reflect more competition, we argue that the number of funds does not capture the effect of market power. For example, the level of competition can be substantially different for a segment with similar-sized funds, and for a segment with one huge fund and a number of smaller funds, even if the two segments have the same number of funds. The (negative of) Herfindahl index is a more appropriate measure of competition because it takes into account the market power of funds and thus should better reflect the level of competition within a fund market segment.

3.5.5 Reverse Causality

In this sub-section, we consider the possibility of reverse causality. Specifically, higher mutual fund fees can attract more funds to a market segment, which may result in greater competition. This is not supported by what we find in untabulated results: the numbers of mutual funds in high-fee segments do not increase faster than those in low-fee segments, possibly due to entry barriers (such as skill requirements) for fund segments. In addition, new funds entering a segment do not necessarily increase the segment's competition, especially for segments with performance insensitive investors. We argue that our results are not likely driven by the increasing competition levels in high-fee fund segments.

3.6 Competition and Fund Fees around the 2008 Crisis

In this sub-section, we further investigate the positive fee-competition relation in a setting in which the level of competition changes dramatically due to external factors unforeseen by fund managers.

The financial crisis in 2008 dealt a heavy blow to the mutual fund industry- the total fund net assets fell by $2.4 trillion (about 20%)[14]. This significantly changed levels of competition in some fund market segments. The average HHI in the fund markets increased from 0.122 to 0.130, suggesting an overall decrease in the competition level; however, for a few large and income market segments (with Lipper classes EIEI, LCCE and LCVE), the HHI in fact went down, making these segments more competitive than prior to the crisis.

Though there's no obvious reason why a financial crisis should affect the level of competition in a market segment in a particular manner, we observe that the expense ratio and the management fee increased for the large and income market segments for which competition has gone up. In untabulated results, we find that the expense ratios (management fees) in those three segments increased by 4 basis points (9 basis points) more compared to other segments after the 2008 crisis. This observation lends further support to the strategic fee setting hypothesis.

4. Conclusion

This paper establishes a direct link between market competition and mutual fund fees. Contrary to popular belief, it shows that mutual funds actually charge higher fees in more competitive market segments.

We consider both the cost based hypothesis and the strategic fee setting hypothesis to explain this rather surprising relation and find empirical evidence consistent with the latter. Fund performance is worse and less persistent in more competitive markets, which drives more performance sensitive investors away. This leaves relatively less performance

[14] See ICI Fact book (2009).

sensitive investors in the more competitive markets. The relatively inelastic demand curve coming from these less performance sensitive investors offers opportunities for the fund managers to increase their management fees.

Our study has important policy implications. We show that market competition per se may not be sufficient to drive down mutual fund fees. Regulatory interventions targeted at encouraging competition or lowering barriers of entry may not be effective either. Instead, interventions targeted at making small investors more aware of the fund fees may help as it will make them more sensitive towards performance of mutual funds after fees are deducted.

In the paper, we consider the possibility that our results may be caused by reverse causality - higher mutual fund fees may attract more funds to the market segment, which may result in greater competition; however, we argue that our results are not likely driven by this. We do not, however, completely rule out the possibility that higher fees can have a positive effect on competition in the long run. A natural extension of our paper would be to study the impact of a change in market competition caused by an exogenous shock to the mutual fund industry (such as by a policy change or a fund market scandal) on fund fees.

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Appendix A: Variable Definitions

Variables	Definitions
12b1 Fee	Annual marketing or distribution fee as a ratio of the total net assets
Class Flow	Net annual flow into a Lipper Class
Class	Value weighted annual return of all the funds in a Lipper class
Competition	Negative of Herfindahl-Hirschman Index
Expense Ratio	Annual expense ratio of a fund as a ratio of the total net assets
Family Net	Total net assets of a fund family expressed in millions
Front Load	the one time transaction fee paid by the investors on purchase of fund share
Fund Age	Age of a fund in months
Fund Flow	A fund's annual new net investment as a percentage of previous total net
Fund	Annual raw return of the fund
HHI	Herfindahl-Hirschman Index
Large Fund	It is a dummy variable which equals 1 if the fund size is greater than or equal
Management Fee	Annual management fee of a fund as a ratio of the total net assets in
Number of Funds	Total number of funds in a Lipper Class
Other Fee	Expenses not included in Management fee and 12b1 fee: custodial expenses,
Return Volatility	Monthly return volatility of a fund
Total Net Assets	Total net assets of a fund expressed in millions
Turnover Ratio	Annual turnover ratio of a fund
Young Fund	It is a dummy variable which equals 1 if the fund age is lower than or equal

Appendix B: Description of Lipper Classes[15]

Lipper Class	Class Name	Investment Focus
EIEI	Equity Income Funds	High current income and growth of income, dividend-paying equity securities.
FS	Financial Services Funds	Equity securities of companies engaged in providing financial services.
H	Health/Biotech Funds	Shares of companies engaged in health care, medicine, and biotechnology.
LCCE	Large-Cap Core Funds	Large-cap stocks with average P/E, P/B, and three-year sales-per-share growth compared to the S&P 500 Index.
LCGE	Large-Cap Growth Funds	Large-cap stocks with above-average P/E, P/B, and three-year sales-per-share growth compared to the S&P 500 Index.
LCVE	Large-Cap Value Funds	Large-cap stocks with below-average P/E, P/B, and three-year sales-per-share growth compared to the S&P 500 Index.
MCCE	Mid-Cap Core Funds	Mid-cap stocks with average P/E, P/B, and three-year sales-per-share growth compared to the S&P Midcap 400 Index.
MCGE	Mid-Cap Growth Funds	Mid-cap stocks with above-average P/E, P/B, and three-year sales-per-share growth compared to the S&P Midcap 400 Index.
MCVE	Mid-Cap Value Funds	Mid-cap stocks with below-average P/E, P/B, and three-year sales-per-share growth compared to the S&P Midcap 400 Index.
MLCE	Multi-Cap Core Funds	A variety of market cap ranges; stocks with average P/E, P/B, and three-year sales-per-share growth compared to the S&P Super Composite 1500 Index.
MLGE	Multi-Cap Growth Funds	A variety of market cap ranges; stocks with above-average P/E, P/B, and three-year sales-per-share growth compared to the S&P Super Composite 1500 Index.
MLVE	Multi-Cap Value	A variety of market cap ranges; stocks with below-average P/E, P/B, and three-year sales-per-share growth compared to the S&P Super Composite 1500 Index.
MTAA	Mixed-Asset Target Allocation Aggressive Growth Funds	At least 80% of assets in equity securities, with the remainder invested in bonds, cash, and cash equivalents.
MTAG	Mixed-Asset Target Allocation Growth Funds	A mix of between 60%-80% equity securities, with the remainder invested in bonds, cash, and cash equivalents.
NR	Natural Resources Funds	Natural resources stocks.
SCCE	Small-Cap Core Funds	Small-cap stocks with average P/E, P/B, and three-year sales-per-share growth compared to the S&P Small Cap 600 Index.
SCGE	Small-Cap Growth Funds	Small-cap stocks with above-average P/E, P/B, and three-year sales-per-share growth compared to the S&P Small Cap 600 Index.
SCVE	Small-Cap Value Funds	Small-cap stocks with below-average P/E, P/B, and three-year sales-per-share growth compared to the S&P Small Cap 600 Index.
TK	Science & Technology Funds	Science and technology stocks.
UT	Utility Funds	Utility shares.

[15] Adapted from www.crsp.com/products/documentation/lipper-objective-and-classification-codes.