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New insights into mutual fund brokerage commissions

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Abstract Using data collected from equity mutual fund reports filed by single-fund registrants to the Securities and Exchange Commission, I study the determinants of brokerage commissions paid by fund managers when they buy or sell securities and investigate the role these commissions play in fund performance. Consistent with related studies, my results from cross-sectional analyses reveal that higher portfolio turnover funds are associated with higher commissions and larger funds incur lower commissions, as well as the positive relation between expense ratios and commissions. This positive relation is puzzling as most commissions include "soft dollars" for payments of products and services that should be already covered by the costs reported under expense ratios. However, once I take into account unobservable fund heterogeneity, I find that higher expense ratio funds do not necessarily pay higher commissions. Further, controlling for whether a fund increased commission payments as the result of flow-induced trading, I show that the underperformance related to brokerage commissions documented in the literature is attributable (at least partly) to higher level of fund flows.

Keywords Mutual funds · Brokerage commissions · Fund flows · Performance

JEL Classification G23 · G24

1 Introduction

Over the years, the commissions paid by mutual fund managers when they buy or sell securities have attracted the media attention and are sometimes described as hidden costs (e.g., Prior 2010; Gao and Livingston 2013). Mutual funds are not required to account for brokerage commissions in the fund prospectus or in the annual report to shareholders. While the U.S. Securities and Exchange Commission (SEC) mandates funds to disclose the commissions in a supplement to the prospectus called the

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Statement of Additional Information (SAI) and in the N-SAR semi-annual and annual filings from registered investment companies, many investors are not familiar with these documents.[1]

Brokerage commissions are not factored in the reported expense ratios. However, these commissions are the second largest mutual fund cost as a percentage of total net assets (*TNA*) after management fees. I find that, over the period 1996 to 2009, the average management fees paid by U.S. equity mutual funds are 0.73 % of *TNA*, while the average commissions are 0.33 % of *TNA*, followed by average marketing and distribution fees of 0.26 % of *TNA*. The Investment Company Institute (2010) reports that the U.S. mutual funds had $11.1 trillion of assets under management at year-end 2009, with 33 % held in U.S. domestic equity funds. I find that the average equity fund paid 0.16 % of *TNA* in commissions in 2009. Thus, U.S. domestic equity funds paid a total of approximately $5.9 billion in brokerage commissions for fiscal year 2009.

Commissions frequently include payments, termed "soft dollars", for products and services other than execution of transactions. On the one hand, these soft dollar payments may raise agency conflicts between fund managers and shareholders because such costs could have been covered by the ongoing costs already deducted from shareholders' assets and reported under expense ratios. On the other hand, the use of soft dollars may help in providing better research products and services, thus better returns. Two natural questions arise. First, do high expense ratio funds pay less brokerage commissions? Second, while it is certainly the case that commissions are a cost for a fund, if funds know ex ante that these trading costs hurt performance, why do some funds continue to pay higher brokerage commissions?

Most previous studies find that brokerage commissions hurt fund performance and that higher expense ratio funds also pay higher brokerage commissions (e.g., Gao and Livingston 2013). Soft dollar arrangements may be used to pay for overhead or research support that allows managers to reduce expenses charged to their investors. Therefore, a negative relation between expenses and commissions suggests that expenses and commissions may serve as substitutes for one another. On the other hand, a positive relation implies that managers of such funds are either investing in securities that are both difficult to research and difficult to trade or they are simply both charging high fund fees and potentially subsidizing payments for research or services other than portfolio transactions with soft dollars. Thus, such positive relation between expenses and commissions is a puzzle.

This study contributes to the existing literature in the following ways by using actual (not estimated) brokerage commissions paid by individual funds. First, I study the determinants of brokerage commissions and analyze the puzzling positive relation between expenses and commissions. Second, I investigate whether and how brokerage commissions improve or impair fund performance by taking into account the levels of investors' inflows and outflows that may induce fund managers to engage in suboptimal trading.

My findings in cross-sectional analyses concur with results from prior studies (e.g., Livingston and O'Neal 1996; Edelen et al. 2007). First, I find that higher portfolio turnover funds are associated with higher commissions, and that larger funds incur lower commissions, as well as the puzzling positive relation between expense ratios

[1] A copy of the N-SAR questionnaire is available at http://www.sec.gov/about/forms/formn-sar.pdf

and commission ratios (i.e. commissions as percentage of *TNA).* The latter suggests that commissions and expenses seem to be complements rather than substitutes. By analyzing the issue in a panel regression context, I find that not to be always the case once unobservable fund heterogeneity (i.e. differences due to fund characteristics that are unobservable and cannot be measured such as managers' skills) is considered. Second, I show that the relation between commissions and performance is more nuanced, as a fund may incur commissions from trades meant to reflect private information (informed trades) or simply incur commissions as the results of flow shocks to the fund (liquidity trades). After controlling for fund inflow (outflow) levels, I find that low inflow (outflow) funds that pay higher commissions outperform high inflow (outflow) funds by 89.7 bps (55.1 bps) per year. In sum, as an alternative explanation to the negative impact of commissions on performance reported by studies that attribute this inverse relation to the use of soft dollars or to poor governance (e.g., Edelen et al. 2012; Gao and Livingston 2013), my results suggest that the underperformance of funds that pay higher brokerage commissions are due (at least in part) to involuntary suboptimal trading induced by investors' inflows and outflows.

The remainder of this study is structured as follows. The next section reviews related studies. Section 3 presents the sample and descriptive statistics. In Section 4, I investigate the relation between expenses and commissions, and explore whether paying high commissions improve or impair performance. Section 5 concludes.

2 Background and related literature

Most studies of mutual fund costs focus on the determinants of expense ratios, as well as the relation between expense ratios, fund flows, and performance. Included in the expense ratio computation are the management fees, the 12b-1 distribution fees, and the other administrative fees referred as "other expenses" in the fund prospectus. [2] These expenses are deducted from shareholders' assets and their impact on performance is well documented in the mutual fund literature (e.g., Sharpe 1966; Hooks 1996; Carhart 1997; Dellva and Olson 1998; Fama and French 2010). Mutual fund returns are measured after the deduction of expenses and transaction costs, but before any costs associated with load charges.[3] There is little evidence that mutual funds consistently generate excess returns that more than offset expenses and transaction costs. Poor performing funds often appear to have higher fees (e.g., Elton et al. 1993; Carhart 1997). Moreover, Dukes et al. (2006) report that failing funds have higher expense ratios than surviving ones. More recently, Edelen et al. (2012) find that, consistent with many studies, the expense ratio is negatively related to performance.

Beginning in the 1950s, brokerage commissions were fixed above competitive levels, so brokerage companies competed for customers by providing additional services. Soon after May 1, 1975, when the SEC abolished the system of fixed brokerage commissions and implemented the current system of negotiated brokerage

[2] 12b-1 fees are named after the SEC rule introduced in 1980 that allows funds to pay distribution expenses out of fund assets.

[3] A load fund collects one-time fees from investors as a percentage of invested money to compensate brokers who sell the fund shares. Load charges may be incurred at the time of purchase, time of redemption, or a mix of both.

rates, the U.S. Congress provided a safe harbor under Section 28(e) of the 1975 amendments of the SEC Act of 1934. This safe harbor would protect fund managers from claims on fiduciary breach of duty for engaging in soft dollar arrangements to pay for research services. Soft dollar arrangements may lead to an agency conflict of interest because investors already pay an annual management fee to compensate fund managers for research and portfolio management, while these soft dollar arrangements allow managers to pay indirectly for such services out of brokerage commissions. Under this safe harbor, fund managers could continue to select a broker for reasons other than portfolio transaction execution.

The SEC does not mandate funds to report the amount of soft dollars they pay. However, it has conducted routine inspections and sweep exams that revealed the widespread use of soft dollars and the inadequacy of soft dollar disclosures by some managers.[4] To address these concerns, the SEC has issued releases about the use and disclosure of soft dollars. The latest related release was issued in July 2006 to provide guidance with respect to narrowing the scope of permissible services under the soft dollar safe harbor (Securities and Exchange Commissions 2006).

The abolition of the system of fixed commissions has triggered studies of brokerage commissions. However, due to the difficulty of obtaining data, such studies are scarce and mostly limited to relatively few funds or cover relatively short time periods. Mimicking studies of expense ratios, studies of brokerage commissions look at the determinants of commissions and the effects of commissions on fund flows and performance. Livingston and O'Neal (1996) use data on brokerage commissions obtained from SAIs of 240 funds from 1989 through 1993. They find that median brokerage commissions as a percentage of average net assets are 21 bps per year with a standard deviation of 27 bps and estimate that mutual funds paid over $1 billion in brokerage commissions in 1993. They show that portfolio turnover is positively related to commissions as a percentage of net assets; larger funds incur lower commissions; and higher expense ratio funds pay higher commissions.

In contrast to Livingston and O'Neal (1996), Horan and Johnsen (2004) find that the use of soft dollars is positively related to risk-adjusted performance using a sample of 1308 institutional portfolios for the period 1979 to 1993. However, similar to studies that report a positive relation between expense ratios and commissions, they also show that higher management fees are associated with higher soft dollars, "suggesting that the labor market competition does not punish managers for using soft dollars" (Horan and Johnsen 2004, Abstract).

Karceski et al. (2005) analyze the determinants of brokerage commissions for funds obtained from Lipper for fiscal year 2002. Consistent with the findings of Livingston and O'Neal (1996), they find that commissions measured as a percentage of average net assets have a positive and statistically significant relation with expense ratios.

Edelen et al. (2007) study the brokerage commissions for 1706 equity funds from Morningstar over the period 1995 to 2005 and use a regression of commissions obtained from N-SAR filings to estimate missing commissions. Using pooled OLS regressions with investment objective fixed effects and year fixed effects, they provide evidence of a positive and statistically significant relation between commissions per

[4] Routine inspections are to identify weaknesses in advisers' internal controls and compliance to policies and procedures. Sweep exams are more focused examinations (e.g., on one issue of regulatory concern).

assets traded and expense ratios. Edelen et al. (2008) also use data from N-SAR reports filed from 1994 to 2006. Their results from pooled OLS regressions controlling for year fixed effects, suggest a negative but statistically insignificant relation between commissions and operating expenses.

Overall, the literature tends to document that, funds with higher expense ratios also have higher commission ratios, thus triggering the question whether commissions hurt performance as expenses have been shown to do. Using expense and commission data from N-SAR filings, Edelen et al. (2012) find that the transparency of expense disclosure mitigates agency costs. Specifically, they run a regression of the total commission payment on selected fund characteristics to decompose commissions into payment for trade execution and payment for other services. They define the payment for other services as the residual from this regression. They show that commissions affect fund performance negatively and that the "excess" commission due to payment for other services has a more negative impact on performance.

Gao and Livingston (2013) use equity fund-level commissions from SEC 485BPOS filings from 2000 to 2007.[5] Their distributions of commission ratios show that funds with higher expense ratios have higher commissions per assets managed and per dollar traded. They also find that commissions impair performance and attribute this negative impact of commissions on performance not only to poor investment decision-making, but also to potential poor governance.

While the previously cited studies, other than the one by Horan and Johnsen (2004), agree on the negative impact of commissions and soft dollars on fund performance, a more recent study by Gao et al. (2014) reports a positive relationship between commissions and performance. Using brokerage commission data for 2001 to 2011 from Lipper, they find that "premium" brokerage services can result in better fund performance.

3 Data and summary statistics

3.1 Sample construction

To study brokerage commissions paid by U.S. equity mutual funds over the period 1996 through 2009, I use data collected from SEC N-SAR filings available on EDGAR.[6] All U.S.-registered investment companies are required to file N-SAR reports on a semi-annual basis on Form N-SAR/A (for the first half of the fiscal year) and on an annual basis on Form N-SAR/B (for the entire fiscal year). The N-SAR filings contain a number of items that are not available in other commonly used databases. Specifically, such items include brokerage commissions and trading activities, as well as fund inflows and outflows. The data appear to be consistently available on EDGAR starting in 1996, the beginning of my sample.

[5] Post-Effective amendments filed pursuant to Rule 485(b) of the Securities Act, which provides for immediate effectiveness of amendments to a prospectus that make non-material changes.

[6] http://www.sec.gov/edgar/aboutedgar.htm

Each registrant files Form N-SAR for either a single fund or a series of funds. Most of the N-SAR items are reported at the individual fund level, but the key variable in this study, brokerage commissions, is reported only as aggregate of the commissions paid by all funds in a filing (i.e., at the registrant level). Therefore, following Edelen et al. (2008) and Edelen et al. (2012), I examine only single-fund filings. Funds from single-fund registrants have higher average and median *TNA* and relatively low portfolio turnover rates and expense ratios compared to funds from multi-fund registrants. However, as Edelen et al. (2008) state, funds are grouped in a multi-fund filing because of a common date of inception into a fund family rather than other specific selection criteria, thus insuring the randomness of my sample.[7]

Form N-SAR requires most dollar values to be reported in thousands rather than in millions, thus leading to a number of data input errors. I expend considerable effort to correct such errors whenever possible. I include a fund in my sample if the fund self-categorizes as an equity fund (per N-SAR item 66A) and has at least $20 million in TNA. However, once a fund is included in the sample, it remains in even if the fund drops its *TNA* below the threshold to avoid selection and/or survivorship biases. I exclude index funds and money market funds, as well as funds that primarily invest in precious metals or in foreign securities.

I omit observations with missing beginning-of-fiscal-year *TNA*, observations with missing or zero values for total expenses, observations with negative values for inflows, as well as observations with missing or zero brokerage commissions. I consider commissions as having a zero value only when no broker or dealer (hereafter, referred as broker) is reported in the filing. Form N-SAR includes a list of the ten highest-paid brokers along with their respective shares of commissions, as well as the total commissions paid by the registrant over the reporting period. When at least one broker is listed in the filing, I round any reported zero value of commissions to one (i.e. $1000) and keep the observation. I exclude fund-year observations with the most extreme values by trimming fund-year observations at the 1 and 99 % levels based on turnover and fund flows.

The semi-annual and annual frequencies of N-SAR filings, as well as missing and erroneous per-share net values, distributions, dividends, or shares outstanding are limitations to studying fund performance. Therefore, I merge the sample of 614 funds obtained from the previous screenings with the CRSP Survivor-Bias-Free U.S. Mutual Fund Database, which has monthly returns. Since data items are not reported at the share class level in the N-SAR filings, I collapse any fund with multiple share classes from CRSP into a single fund as commonly done in mutual fund studies. The merged N-SAR/CRSP sample includes 467 actively managed equity funds reporting 3263 fund-year observations over the fiscal years ending in 1996 to 2009.[8] Obviously, a natural critique to this study is that such few funds may not be representative of the equity mutual fund universe. However, looking at these individual funds and their actual paid brokerage commissions helps shed some light in the puzzle on hand.[9]

[7] A fund (e.g., Fidelity Magellan Fund) filed by a single-fund registrant may also be part of a fund family.
[8] My sample is more restricted than that of Edelen et al. (2012) who study a total of 765 funds (7597 semiannual observations).
[9] Moreover, in their analysis of commission bundling, Edelen et al. (2012) show that, results for single-fund and multi-fund registrants are similar.

3.2 Summary statistics

Table 1 provides summary statistics on selected fund characteristics for the merged sample. Soft dollar payments are not reported in N-SAR filings. Instead, registrants are required to report considerations they have in selecting brokers. Specifically, they are required to indicate whether or not their selection of brokers for the reporting period was affected by sales of the fund shares, receipt of investment research, receipt of quotations, best execution of portfolio transactions, receipt of telephone line and wire services, an affiliation with the broker, rebates on commissions, or other considerations. Registrants may list one or more considerations. As shown in Panel A of Table 1, most registrants (91 % of fund-year observations) indicate that they consider the ability to obtain best price and execution of portfolio transactions when they select brokers (N-SAR item 26D). Therefore, I categorize the considerations other than for best price and execution of transactions into five groups: *Distribution consideration, Advisory consideration*, *Administrative consideration*, *Research consideration*, and *Other consideration*. I classify a fund as using soft dollars if the registrant reports one or more considerations within these five groups (i.e., any consideration other than for best price and execution). Panel A of Table 1 shows that 83 % of the 3263 fund-year observations in my sample include the use of soft dollars. Research consideration is the most frequent motive other than best price and execution that managers have when selecting brokers as indicated in 80 % of the observations.

I obtain the statistics in Panel B of Table 1 by first averaging each variable by fund and then calculating the statistics over the 467 funds. As shown, the average fund in the sample annually pays out 0.33 % of its assets under management in commissions in addition to an expense ratio of 1.67 %. Together, these costs represent a relatively large deduction from shareholders' assets. The average fund manages $1695.4 million in *TNA*. Based on average commissions and average *TNA*, the average fund pays a total of approximately $5.6 million in commissions. The median *TNA* is lower at $289.7 million, reflecting the considerable positive skewness in fund size commonly noticed in mutual fund studies. Considering commissions as a percentage of traded assets (*Commission rate*), the average fund pays out 0.14 % of its sum of purchases and sales per year in commissions.

One advantage of using N-SAR data is the ability to separately examine a fund's inflow and outflow, as opposed to being limited to an implied net flow calculated from CRSP data. While the average fund incurs a net flow of 9.04 % of beginning-of-fiscal-year *TNA*, there is noticeably more flow activity in the fund. The average fund has an inflow (exclusive of reinvested distributions) of 48.64 % and an outflow of 40.08 % of beginning-of-fiscal-year *TNA* per year.[10] As I highlight later, this considerable variation in fund flows has a noticeable impact on the relation between commissions and fund performance.

Form N-SAR includes a list of the ten brokers paid the most by a fund, along with the dollar amount of commissions paid to each of these brokers. Edelen et al. (2012) use the breakdown of commissions among the top ten brokers to calculate a Herfindahl index (*Broker Herfindahl*) by summing the squared value of the percent of total commissions

[10] Clifford et al. (2013) report an average of 4.65% (4.61 %) for monthly inflows (outflows) for a sample of equity funds over the period 1999 to 2009. At the 90th percentile, their sample monthly inflows (outflows) are 8.46% (6.93 %).

Table 1 Fund-level statistics for N-SAR/CRSP merged sample of equity funds

Panel A. Considerations in selecting brokers or dealers for portfolio transactions						
Fund-year observations				3263		
Best price and execution				91 %		
Research consideration				83 %		
Administrative consideration				31 %		
Distribution consideration				22 %		
Advisory consideration				20 %		
Other consideration				12 %		
With soft dollars consideration				86 %		
No soft dollars consideration				14 %		
Panel B. Fund-level statistics						
	Number	Mean	Median	10th percentile	90th percentile	Standard deviation
TNA ($ millions)	467	1,695.4	289.7	7.6	4,485.7	4,829.4
Commission ratio	467	0.33 %	0.19 %	0.05 %	0.55 %	0.63 %
Commission rate	467	0.14 %	0.11 %	0.05 %	0.22 %	0.16 %
Expense ratio	467	1.67 %	1.40 %	0.83 %	2.16 %	2.40 %
Turnover	467	87.55 %	68.98 %	18.75 %	175.43 %	79.21 %
Inflow	467	48.64 %	33.26 %	7.61 %	104.91 %	54.21 %
Outflow	467	40.08 %	33.31 %	14.27 %	68.92 %	30.44 %
Net flow	467	9.04 %	−0.50 %	−17.95 %	45.25 %	38.85 %
Monthly raw return	467	0.80 %	1.02 %	−2.85 %	4.05 %	3.41 %
Broker Herfindahl	467	0.26	0.10	0.11	0.66	0.24
Broker concentration ratio	467	76.29 %	73.36 %	54.86 %	100.00 %	17.00 %

Panel A presents the percentages of fund-year observations reporting each type of considerations in selecting brokers or dealers for portfolio transactions. A registrant may report more than one consideration in a filing. I classify a fund to have soft dollars consideration if the fund reports any consideration other than best price and execution when selecting brokers or dealers (i.e. an affirmative answer to any of N-SAR items 26A to 26H other than 26D) for the reporting fiscal year. Panel B reports fund-level summary statistics on selected fund characteristics for the sample of 467 equity funds (3263 fund-year observations) obtained by merging the N-SAR sample with CRSP funds. The statistics are obtained by first averaging each variable by fund and then calculating the statistics over the sample funds. The sample includes funds from N-SAR/B filings by single-fund registrants for fiscal years ending in 1996 to 2009

paid to each broker. The maximum value of 1 for this variable indicates that all commissions were paid to a single broker and the minimum value of 0.1 means that the commissions were equally split among all ten brokers. From Table 1, the average fund's *Broker Herfindahl* is 0.26, with a median of 0.13, suggesting that most funds in the sample use multiple brokers. In addition to the *Broker Herfindahl*, I define a 10-broker concentration ratio (*Broker concentration ratio*) to measure the percentage of commissions paid by a fund to its ten top brokers. A low *Broker concentration ratio* indicates that commissions paid to the ten top brokers do not represent a significant portion of the total commissions paid by a fund. As shown in Table 1, the average fund's *Broker concentration ratio* is 76.29 %, indicating that most commissions are paid to the top ten brokers.

There is a sizeable variation of commissions as a percentage of beginning-of-fiscal-year *TNA* as reflected by the 0.63 % standard deviation of *Commission ratio*. At the 10th and 90th percentile, commissions represent 0.05 and 0.55 % of beginning-of-fiscal-year *TNA*, respectively. In the next section, I investigate the potential sources of this variation in commissions.

4 Empirical analyses

4.1 Do higher expense ratio funds pay higher brokerage commissions?

To study the determinants of commissions, my baseline models take the general form:

$$Commission\ ratio_{j,t} = Controls_{j,t} + Fixed\ effects_j + \varepsilon_{j,t} \quad (1)$$

where, for each fund j and year t,

(i) *Commission ratio* is the commissions as a percentage of beginning-of-fiscal-year *TNA*[11]

(ii) $Controls_{j,t}$ represents the control variables, consisting of selected fund characteristics that may affect commissions: *Expense ratio, Turnover, Log size, Broker Herfindahl, Broker concentration ratio,* fund flows *(Inflow, Outflow, or Net flow), Soft dollars dummy*, *In family dummy* and primary investment *Objective dummies*.[12] The selection of these characteristics is motivated by prior related studies and data availability;

(iii) $Fixed\ effects_j$ represents time and/or fund fixed effects.

To address the possible persistence in commissions, one could control for lagged commissions in the model. The inclusion of lagged commissions does not affect my findings. However, I opt not to control for the lagged commissions. Their inclusion may lead to dynamic panel bias because, with the fixed effects, the lagged dependent variable is correlated with the residuals (Flannery and Hankins 2013).

[11] To make commission ratios comparable to expense ratios, I use *Commission ratio* rather than *Commission rate* (commissions as a percentage of total trade) in the models. Considering commissions as a percentage of current fiscal year *TNA* or as a percentage of average *TNA*, instead of a percentage of beginning-of-fiscal-year *TNA*, I find similar results.

[12] Equity funds indicate their investment objectives in N-SAR filings. I control for such objectives only in OLS models because investment objectives are time-invariant, thus already controlled for in panel FE models.

Most related studies rely on pooled ordinary least squares (OLS) models.[13] While I test the models described by Eq. (1) using pooled OLS regressions so that my results are comparable to those of previous studies, I take into account the panel structure of the sample and explore the models using panel regressions. However, the sample panel dataset raises issues about heteroskedastic errors that may arise from correlation across funds within years and/or correlation across years within funds. To account for time effects and possible (unobserved) omitted characteristics, I include both time and fund fixed effects in the panel models. In addition, I cluster the standard errors at the fund level.

To my knowledge, I am the first to control for individual fund heterogeneity with panel fixed effects (panel FE) models for analyzing brokerage commissions. Panel models are appropriate to exploit the panel structure of the data in which a cross-section of funds is observed over time. Moreover, panel FE models take into account of unobserved characteristics that are time-invariant but may differ across funds. The general form of a panel model can be represented with the following equation:

$$Y_{j,t} = \underline{X}'_{j,t}\underline{\beta} + \alpha_j + \varepsilon_{j,t} \tag{2}$$

where, in this study, the term α_j represents the effects of fund j that are stable over time. A fixed effects model interprets these effects as an estimated value of the *fixed* effects of the individual fund, distinguishing the changes within funds from changes between funds. A random effects model estimates the same effects but reports them as the variance of the estimated effects over the sample, thus *random*. An OLS model assumes that there are no such effects.

To determine whether a panel FE model is more appropriate, I run a Breusch-Pagan Lagrange Multiplier (LM) test for random effects (Breusch and Pagan 1980) followed by a Hausman test for random effects versus fixed effects (Hausman 1978) for each of my brokerage commission models. The null hypothesis for the Breusch-Pagan LM test is that the variance of the error term is zero. If that is the case, then there are no random effects in the model. For each model, I find a significant rejection of the Breusch-Pagan LM test null hypothesis, which implies that OLS should not be used. Instead, a random effects model is more appropriate.

The null hypothesis for the Hausman test is that both fixed effects and random effects estimators are consistent, and since a random effects estimator is more efficient (because no fund dummies are involved), it should be preferred over the fixed effects estimator. A significant rejection of the Hausman test null hypothesis means that a fixed effects model should be used. However, the Hausman test is not valid when robust standard errors are clustered in a model as it is the case in my brokerage commission models. The test requires the random effects estimator to be efficient. This requirement in turn requires that the α_j and $\varepsilon_{j,t}$ in Eq. (2) are independent and identically distributed, which is an invalid assumption if cluster-

[13] Gao and Livingston (2013) and Edelen et al. (2012) examine brokerage commissions at the fund level and for relatively large panel data. However, neither of these studies control for individual fund fixed effects.

robust standard errors for the random effects estimator differ substantially from default standard errors (Cameron and Trivedi 2009). Therefore, I use the robust Hausman test described by Wooldridge (2002) to test whether a fixed effects model is more appropriate than a random effects model for this analysis of brokerage commissions.

As described by Wooldridge (2002), the null hypothesis for the robust Hausman test is that the estimated coefficient γ is zero in the following auxiliary OLS regression:

$$\left(Y_{j,t}-\widehat{\theta}\overline{Y}_j\right)+\left(1-\widehat{\theta}\right)\alpha+\left(X_{1j,t}-\widehat{\theta}\overline{X}_{1j}\right)'\beta_1+\left(X_{1j,t}-\overline{X}_{1j}\right)'\gamma+v_{j,t} \quad (3)$$

where X_1 denotes only time-varying independent variables, $\widehat{\theta}_j$ (referred as *theta*) is the weight used in combining the between and fixed estimators, $\left(X_{1j,t}-\widehat{\theta}\overline{Y}_j\right)$ and $\left(X_{1j,t}-\widehat{\theta}\overline{X}_{1j}\right)$ are the random effects differences, and $\left(X_{1j,t}-\overline{X}_{1j}\right)$ are the mean differences. In this study, the sample panel data is unbalanced, so I calculate the value of *theta* for each observation. I find a significant rejection of the null hypothesis of the robust Hausman test for each of my models, which implies that a random effects model is not appropriate; instead a fixed effects model should be used.

Moreover, fixed effects models estimate the effect of changes in explanatory variables on changes in the dependent variable. OLS models estimate the effect of levels and changes in explanatory variables on levels and changes in the dependent variable. Average levels are present in OLS models, absent in fixed effects models. In the context of this study and given the panel structure of the data, it is also worth to explore how a change in fund characteristics from year to year affects the change in commissions from year to year; that is, exploring the impact of changes within funds in addition to just across funds. The results from the regressions are in Table 2.

To ease the relative economic interpretation of the results, I convert all continuous independent variables (but not the dependent variable) to their *z*-scores. The *z*-score of a continuous variable is calculated by demeaning the variable and scaling it by its standard deviation. As a result, the estimated coefficient on the continuous variable is the impact on the commission ratios (in % points in this study) of a one standard deviation change in the independent variable.

The models in Table 2 mainly differ on whether a model includes fund flows or not. For brevity, I restrict most of my description and interpretation herein to Model 1 (no flows) because most related studies do not control for fund flows. Consistent with previous studies (e.g., Livingston and O'Neal 1996; Karceski et al. 2005), the coefficients on *Log size* are negative and statistically significant in all five models. These results imply that larger equity funds tend to pay lower commissions as a percentage of beginning-of-fiscal-year *TNA*.[14] Higher turnover

[14] In unreported tests, I include the square of *Log size* in the models to check for the possibility of diseconomies of scale with respect to commissions. None of the coefficients on the square of *Log size* are statistically significant.

is associated with higher commissions. For example, without controlling for flows (Model 1), a one standard deviation increase in turnover (79.21 percentage points) increases commissions by 0.35 percentage points (OLS model) and by 0.15 percentage points (FE model). As shown, the coefficients on *Expense ratio* in all OLS models are positive and highly statistically significant, implying that higher expense ratios are associated with higher commission ratios. In OLS Model 1, a one standard deviation increase in expense ratios (0.63 percentage points) is associated with an increase of 0.07 percentage points in commission ratios. Livingston and O'Neal (1996) attribute such positive relation between expense ratios and commissions per net assets to some managers who invest in securities that are both difficult to research and difficult to trade or to others who "are simply less resolute about reducing fund expenses" (p. 281). These results on expense ratios from OLS models are somewhat puzzling. For instance, higher brokerage commissions may be due to higher research costs. Therefore, if expense ratios and commissions are related, they would be inversely related because if research or other services are paid out of brokerage commissions (with soft dollars), resulting in higher commissions, at least management fees should be lower, thus resulting in a lower expense ratio.

Once individual fund heterogeneity is taken into account in my FE models, all the coefficients on *Expense ratio* change sign (positive to negative), lose statistical significance, or do both. Specifically (in FE Model 1), a one standard deviation increase in expense ratios decreases commissions per beginning-of-fiscal-year *TNA* by 0.06 percentage points. My findings suggest that unobserved fund-specific characteristics that increase commissions and are positively correlated with expense ratios create upwards bias in the estimated coefficients of *Expense ratio* from the pooled OLS models, which explains the puzzle. The within-fund estimates indicate that expenses and commissions tend to be substitutes rather than complements.

While none of the coefficients on *Broker Herfindahl* are statistically significant across Table 2, those on *Broker concentration ratio* are negative and statistically significant; implying that an increase in the percentage of commissions paid to the top ten brokers is associated with a decrease in commissions as a percentage of beginning-of-fiscal-year *TNA*. As shown in the pooled OLS models, the coefficients on *Soft dollars dummy* are positive and statistically significant, suggesting that, across funds, soft dollars arrangements tend to inflate commissions paid per net assets. As expected, there is no strong evidence on whether that is also the case within funds because the use of soft dollars is almost time-invariant.[15]

It is worth to notice that fund flows are positively related to commissions. In FE Model 3 (Model 4) of Table 2, a one standard deviation increase in fund inflows (outflows) increases commissions by 0.26 percentage points (0.28 percentage points). Later, I show how fund flows impact the relation between brokerage commissions and fund performance.

[15] One would expect that a fund that belongs to a fund family could benefit from some economies of scales in regard to commissions. However, while I include the *In family dummy* variable in my models, I have reservations about interpreting the related results because the reporting of this variable is not consistent in the N-SAR filings.

Table 2 Pooled OLS and panel regressions of commissions: do high expense ratio funds pay high brokerage commissions?

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Pooled OLS	Panel FE	Pooled OLS	Panel FE	Pooled OLS	Panel FE	Pooled OLS	Panel FE	Pooled OLS	Panel FE
Log size	−0.124***	−0.347***	−0.065***	−0.213***	−0.061***	−0.155***	−0.080***	−0.273***	−0.072***	−0.161***
	[<0.001]	(<0.001]	[<0.001]	[<0.001]	[0.001]	[0.002]	[<0.001]	[<0.001]	[<0.001]	[0.002]
Turnover	0.349***	0.145**	0.321***	0.157**	0.337***	0.159**	0.311***	0.154**	0.353***	0.157**
	[<0.001]	[0.049]	[<0.001]	[0.018]	[<0.001]	[0.029]	[<0.001]	[0.015]	[<0.001]	[0.042]
Expense ratio	0.070***	−0.062*	0.092***	−0.040	0.097***	−0.030	0.082***	−0.049*	0.095***	−0.031
	[0.005]	[0.063]	[0.001]	[0.161]	[<0.001]	[0.225]	[0.002]	[0.095]	[<0.001]	[0.249]
Broker Herfindahl	−0.001	0.022	0.010	−0.002	0.006	0.005	0.012	−0.003	0.001	0.013
	[0.960]	[0.547]	[0.585]	[0.932]	[0.741]	[0.878]	[0.537]	[0.903]	[0.940]	[0.716]
Broker concentration ratio	−0.045***	−0.076***	−0.032***	−0.061***	−0.031**	−0.060***	−0.037***	−0.064***	−0.032**	−0.063***
	[0.006]	[<0.001]	[0.008]	[<0.001]	[0.013]	[<0.001]	[0.005]	[<0.001]	[0.012]	[<0.001]
In family dummy	−0.068	−0.049	−0.113***	−0.058	−0.099***	−0.043	−0.116***	−0.066	−0.081**	−0.035
	[0.106]	[0.446]	[0.002]	[0.142]	[0.008]	[0.283]	[0.001]	[0.139]	[0.042]	[0.433]
Soft dollars dummy	0.088**	0.005	0.070*	0.010	0.069*	−0.007	0.075*	0.020	0.072*	−0.015
	[0.048]	[0.840]	[0.073]	[0.695]	[0.089]	[0.770]	[0.053]	[0.418]	[0.095]	[0.547]
Inflow			0.159***	0.113**	0.288***	0.256***				
			[0.002]	[0.042]	[<0.001]	[<0.001]				
Outflow			0.164***	0.186**			0.291***	0.282***		
			[0.006]	[0.012]			[<0.001]	[<0.001]		
Net flow									0.239***	0.210***
									[<0.001]	[<0.001]
Intercept	0.172**	0.307***	0.255***	0.302***	0.248***	0.321***	0.245***	0.290***	0.226***	0.330***
	[0.013]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[<0.001]	[0.001]	[<0.001]

Table 2 (continued)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Pooled OLS	Panel FE	Pooled OLS	Panel FE	Pooled OLS	Panel FE	Pooled OLS	Panel FE	Pooled OLS	Panel FE
R-squared	37 %	61 %	59 %	72 %	56 %	70 %	57 %	71 %	50 %	72 %
F-value	13.14***	9.95***	16.49***	10.22***	17.15***	10.78***	14.97***	10.21***	16.49***	10.22***
Objective dummies	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Fund fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Year fixed effects = Yes; Number of observations = 3263; Number of funds = 467										

This table presents the results from pooled OLS and panel fixed effects (panel FE) regressions of *Commission ratio* (in %) on selected fund characteristics for a sample of equity funds from N-SAR filings by single-fund registrants for fiscal years ending in 1996 to 2009. All continuous independent variables are converted to *z*-scores to allow for direct comparison of their economic significance. The interpretation of a coefficient is the change (in percentage points) in *Commission ratio* based on a one standard deviation change in the independent variable. I include investment objective dummies in all pooled OLS regressions, fund fixed effects in all panel regressions, and year fixed effects in all regressions. Standard errors are robust to heteroskedasticity and clustered at the fund level. The symbols ***, **, and * represent statistical significance at the 1, 5, and 10 % level, respectively. I report *p*-values in brackets

4.2 Does paying more in brokerage commissions improve or impair fund performance?

Over the years, much controversy has existed regarding brokerage commissions and particularly the use of soft dollars. Soft dollars are believed to inflate commissions. The issue at hand is that if managers who already pay for products or services other than portfolio transactions as part of brokerage commissions still charge higher management fees, an agency conflict arises. If that is the case, investors in funds with both higher expense ratios and higher commission ratios would experience lower risk-adjusted returns.

To investigate whether paying more in brokerage commissions improves or impairs performance, I do both a univariate analysis by comparing five portfolios formed by sorting funds by lagged *Commission ratio* and a multivariate analysis by regressing fund annual four-factor alphas on lagged *Commission ratio*.

Monthly alphas (α_j) are obtained from regressing excess returns on the three Fama and French (1993) factors along with the Carhart (1997) momentum factor:

$$R_{j,m}-R_{f,m} = \alpha_j + \beta_j\left(R_{M,m}-R_{f,m}\right) + s_j SMB_m + h_j HML_m + u_j MOM + \varepsilon_{j,m} \quad (4)$$

where, for each fund j and month m,

(i) $R_{j,m}$ is the monthly return on fund j in month m;
(ii) $R_{f,m}$ is the risk-free rate in month m;
(iii) $R_{M,m}$ is the return on the market in month m;
(iv) SMB_m is the difference between returns on small and big stock portfolios in month m;
(v) HML_m is the difference between returns on high and low book-to-market portfolios in month m;
(vi) MOM_m is the difference between returns on high prior return and low prior return portfolios.

The multivariate models are defined by:

$$\begin{aligned} alpha_{j,t} = {} & Commission_{j,t-1} + \left(Commission_{j,t-1} \times High\ flow_{j,t-1}\right) \\ & + High\ flow_{j,t-1} + Controls_{j,t-1} + Fixed\ effects_j + \varepsilon_{j,t} \end{aligned} \quad (5)$$

where, for fund j and year t,

(i) $alpha_{j,t}$ is the annual abnormal return on fund j in year t defined as the average monthly abnormal return times 12;
(ii) $Commission\ ratio_{j,t-1}$, the independent variable of interest is the total commissions as a percentage of beginning-of-fiscal-year *TNA* in year *t-1*;
(iii) $High\ net\ flow_{j,t-1}$ ($High\ inflow_{j,t-1}$ or $High\ outflow_{j,t-1}$) takes a value of one if fund j has an above sample median net flow (inflow or outflow) in year *t-1* and zero otherwise;
(iv) $(Commission\ ratio_{j,t-1} \times High\ flow_{j,t-1})$ is the interaction of $Commission\ ratio_{j,t-1}$ with $High\ flow_{j,t-1}$;
(v) $Controls_{j,t-1}$ consists of a number of selected fund characteristics;
(vi) $Fixed\ effects_j$ are controlled with year dummies and primary investment objective dummies.

Table 3 presents the results from comparing five portfolios formed by sorting the sample funds based on one-year lagged commissions per beginning-of-fiscal year net assets. Specifically, I sort the funds into quintiles based on their commissions in fiscal year *t-1*. I take a long-position in the portfolio that includes funds with the highest lagged commissions (Portfolio 5) and a short position in the portfolio formed with funds with the lowest lagged commissions (Portfolio 1), and regress the return difference on the three Fama and French (1993) factors along with the Carhart (1997) momentum factor described in Eq. (4) over the 12 months of fiscal year *t*. The abnormal return (*alpha)* from the four-factor model measures the impact of commissions on performance. A positive *alpha* would indicate that higher commissions improve performance.

In Table 3, both Panel A (based on equally-weighted returns) and Panel B (based on *TNA*-weighted returns) show that the hedge portfolio displays a negative *alpha* of −7.7 and −17.1 bps per month, respectively, though *alpha* is not statistically significant in Panel A. These results imply that, consistent with the literature, funds paying higher commissions per net assets relatively underperform.

With either weighting scheme, the portfolios with the highest lagged commissions have relatively large market betas. Karceski (2002) provides evidence that fund managers tend to invest inflows in higher beta stocks. In Panel A, the coefficient on *SMB* is positive and monotonically rising across the quintiles ranging from zero (Portfolio 1) to 0.25 (Portfolio 5). In Panel B, the coefficient on *SMB* is also positive (0.13) for Portfolio 5 but negative (−0.05) for Portfolio 1. Both Panels A and B show that the long-short portfolio has a negative and statistically significant coefficient on *HML*. Thus, funds that incur the highest commissions tend to buy small cap growth stocks, at least statistically.

Regardless of the weighting scheme, the lowest paying commission portfolio has a statistically significant negative coefficient on the momentum factor loading (−0.05 in Panel A and −0.04 in Panel B). In contrast, the highest paying commission portfolio has a statistically positive coefficient on *MOM* (0.06 in both Panels A and B), implying that funds paying higher commissions tend to purchase recent winners. In sum, the results from Panels A and B of Table 3 suggest that low commission funds and high commission funds also differ in regard to other aspects, such as the ways they trade.

Table 4 presents the coefficient estimates from pooled OLS regressions of fund performance (measured by annual four-factor alpha) on lagged *Commission ratio*.[16] As in many studies, the expense ratio is negatively related to performance. Consistent with the scale effects documented by Chen et al. (2004), the coefficients on *Log size* are negative, though not statistically

[16] To make the models comparable with most mutual fund performance models, I use pooled OLS models here. Moreover, the Breusch-Pagan LM test null hypothesis cannot be rejected for each performance model, thus a panel model is less appropriate. Table 4's R-squared are low, but higher than those of Edelen et al. (2012) in their Table 5 and Table 8.

Table 3 Does paying more in brokerage commissions improve or impair fund performance?

	Commission ratio$_{(t-1)}$ quintiles					
	Lowest 1	2	3	4	Highest 5	5–1
Panel A. Abnormal returns per month by lagged commission quintiles based on equally-weighted net raw returns						
Alpha (bps)	−1.5	−3.7	−5.2	−0.6	−9.2	−7.7
	(−0.27)	(−0.71)	(−0.95)	(−0.67)	(−1.03)	(−0.84)
Market excess return	0.88***	0.91***	0.97***	0.96***	0.98***	0.10***
	(72.07)	(77.46)	(78.35)	(61.31)	(48.46)	(4.64)
SMB	0.00	0.09***	0.15***	0.14***	0.25***	0.25***
	(0.05)	(6.49)	(9.90)	(7.36)	(10.30)	(9.90)
HML	0.11***	0.05***	0.04***	0.08***	0.04	−0.07***
	(6.76)	(3.06)	(2.66)	(3.87)	(1.34)	(−2.66)
MOM	−0.05***	−0.01	0.00	0.04***	0.06***	0.11***
	(−5.72)	(−1.19)	(0.44)	(3.03)	(3.54)	(6.75)
Number of months	162	162	162	162	162	162
R-squared	98 %	98 %	98 %	97 %	96 %	63 %
F-value	1724.53***	2037.34***	2124.62***	1229.12***	832.97***	66.68***
Panel B. Abnormal returns per month by lagged commission quintiles based on TNA-weighted net raw returns						
Alpha (bps)	2.2	−9.6	−7.9	−23.7**	−14.9*	−17.1*
	(0.40)	(−1.58)	(−1.12)	(−2.48)	(−1.86)	(−1.74)
Market excess return	0.83***	0.94***	1.03***	1.01***	0.99***	0.16***
	(64.45)	(67.67)	(63.77)	(46.76)	(54.32)	(7.14)
SMB	−0.05***	0.06***	0.15***	0.03	0.13***	0.18***
	(−3.27)	(3.63)	(7.93)	(1.34)	(6.05)	(6.77)
HML	0.04**	−0.05**	−0.10***	−0.08***	−0.04*	−0.08***
	(2.29)	(−2.60)	(−4.93)	(−2.70)	(−1.86)	(−2.81)
MOM	−0.04***	0.01	0.05***	0.02	0.06***	0.10***
	(−3.94)	(1.00)	(4.38)	(1.50)	(4.21)	(5.66)
Number of months	162	162	162	162	162	162
R-squared	97 %	98 %	97 %	95 %	96 %	58 %
F-value	1378.03***	1572.02***	1459.12***	741.72***	1013.22***	53.47***

This table reports the results from comparing five portfolios formed by sorting 467 actively managed equity funds on lagged *Commission ratio* (%) for the period 1996 to 2009. I sort the funds into quintiles at the end of fiscal year *t-1* (162 year-months) and estimate alphas by regressing excess returns on the three Fama-French (1993) factors along with the Carhart (1997) momentum factor over the 12 months of fiscal year *t*. *SMB* is the difference between returns on small and big stock portfolios. *HML* is the difference between returns on high and low book-to-market portfolios. *MOM* is the difference between returns on high prior return and low prior return portfolios. Portfolio 1 (Portfolio 5) includes funds with the lowest (highest) lagged commission ratio. I form a hedge portfolio by taking a long position in Portfolio 5 and a short position in Portfolio 1. The estimated *alpha* for the hedge portfolio indicates whether commissions improve or impair performance. In Panel A, the performance is based on equally-weighted net raw returns. In Panel B, the performance is based on *TNA*-weighted net raw returns. Monthly net raw returns are from CRSP. The symbols ***, **, and * represent statistical significance at the 1, 5, and 10 % level, respectively. I report *t*-statistics in parentheses

significant. Among others, Gao and Livingston (2013) find a negative and statistically significant relation between commissions and performance. They report that a one basis point increase in annual commissions per net assets decreases the annual four-factor alpha by 5.81 to 6.22 bps per year. With Model 1 of Table 4, the coefficient on *Commission ratio* is negative but not statistically significant at conventional levels. Controlling for the level of net flow and its interaction with the commission ratios (Model 3 of Table 4), the slope of the regression line for funds with above median level net flow is negative [−0.188=0.057+(−0.245)] but not statistically significant (*p*-value=0.146). With Models 5 and 7 of Table 4, for funds with low level of inflow (outflow), an increase of one standard deviation in annual commissions per net assets is associated with an increase of 78.9 bps (84.3 bps) in abnormal return per year. With Model 5, the coefficient of the interaction variable is negative and statistically significant at the 5 % level. This latter result means that the sensitivity of *alpha* to *Commission ratio* is not the same for funds with below median level of inflows and funds with above median level of inflows. To determine the impact of commission ratios on abnormal returns for funds with above median level of inflows, we need to add (cf. Dougherty 2011) the coefficient on C*ommission ratio* (0.789) to the coefficient on the interaction variable (−1.686) which yields a statistically significant coefficient of −0.897 (*p*-value of 0.084). This result implies that, on average and all else equal, an increase of one standard deviation in annual commissions per net assets (here 0.63 percentage points) decreases *alpha* by 89.7 bps per year for funds with above median level of inflows. Similarly, in Model 7, the sum of the coefficients on *Commission ratio* and on the interaction variable is −0.551 (=0.843 −1.394), implying that, on average and all else equal, an increase of one standard deviation in annual commissions per net assets decreases *alpha* by 68.3 bps per year for funds with above median level of outflows.

In unreported robustness tests, I repeat the analyses reported in Table 4 with commissions per traded assets by using *Commission rate* instead of *Commission ratio* in Eq. (5). The results are consistent with those in Table 4. I also repeat the previous analyses by size category. At the beginning of each fiscal year, fund-year observations are sorted into three size categories (small, medium, and large). The unreported results are similar to the findings in Table 4, though the estimated coefficients are more significant for small funds.

Clearly, the results in Table 4 suggest that the underperformance of higher commission funds reported by related studies is due (at least in part) to investor inflows and outflows. As Edelen (1999) states, “the flow shock that the fund experiences moves the fund away from the target portfolio” (p.443). Managers are forced to buy more securities to allocate the new money coming into the funds. In the same vein, they have to sell more securities when investors redeem their shares. Once the impact of flow levels is accounted for, higher commissions actually tend to improve performance. These findings are also related to the more recent results by Gao, Livingston, and Zhou (2014) who show that commissions and performance are positively related.

Table 4 How do fund flows affect the relation between commissions and performance?

	Dependent variable: annual four-factor alpha$_t$ (%)						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Commission ratio$_{(t-1)}$	−0.388	−0.481	0.057	−0.511	0.789*	−0.416	0.843**
	[0.439]	[0.344]	[0.774]	[0.301]	[0.087]	[0.402]	[0.046]
Commission ratio$_{(t-1)}$ × High net flow$_{(t-1)}$			−0.245				
			[0.796]				
High net flow$_{(t-1)}$		1.162	1.144				
		[0.402]	[0.398]				
Expense ratio$_{(t-1)}$	−0.747*	−0.670*	−0.694	−0.711*	−0.748*	−0.765*	−0.766*
	[0.072]	[0.075]	[0.111]	[0.074]	[0.079]	[0.080]	[0.083]
Log size$_{(t-1)}$	−0.039	−0.075	−0.074	−0.118	−0.114	−0.051	−0.048
	[0.952]	[0.903]	[0.905]	[0.845]	[0.850]	[0.935]	[0.939]
Turnover$_{(t-1)}$	−0.888	−0.819	−0.848	−0.815	−1.040	−0.888	−0.933
	[0.489]	[0.533]	[0.519]	[0.530]	[0.365]	[0.487]	[0.447]
High inflow$_{(t-1)}$				1.770	1.681		
				[0.196]	[0.211]		
Commission ratio$_{(t-1)}$ × High inflow$_{(t-1)}$					−1.686**		
					[0.016]		
High outflow$_{(t-1)}$						0.653	0.637
						[0.667]	[0.667]
Commission ratio$_{(t-1)}$ × High outflow$_{(t-1)}$							−1.394***
							[0.008]
Intercept	−1.918	−2.635	−2.629	−3.163	−3.195	−2.402	−2.417
	[0.250]	[0.202]	[0.203]	[0.141]	[0.142]	[0.288]	[0.289]

Table 4 (continued)

	Dependent variable: annual four-factor alpha$_t$ (%)						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Fund-year observations	2,677	2,677	2,677	2,677	2,677	2,677	2,677
R-squared	1.14 %	1.17 %	1.17 %	1.20 %	1.21 %	1.15 %	1.15 %
F-value	8.25***	8.09***	8.08***	8.08***	7.73***	7.99***	7.68***
Objective dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commission ratio + Commission ratio × High net flow = 0			[0.146]				
Commission ratio + Commission ratio × High inflow = 0					[0.084]		
Commission ratio + Commission ratio × High outflow = 0							[0.097]

This table presents the results from pooled OLS regressions of fund performance on lagged commissions and selected fund characteristics for the 467 actively managed equity funds. The dependent variable is the annual four-factor alpha (in %) defined as the monthly alpha times 12. *Commission ratio* represents commissions as a percentage of beginning-*TNA*. To allow for direct comparison of economic significance, all continuous independent variables are converted to *z*-scores. Therefore, the interpretation of a coefficient is the change (in percentage points) in abnormal return based on a one standard deviation change in the independent variable. Models 3, 5 and 7 include an interaction of *Commission ratio* with *High net flow*, *High inflow*, and *High outflow*, respectively. *High net flow* (*High inflow*, *High outflow)* is a dummy variable that takes a value of one if a fund's net flow (inflow, outflow) is above the sample median net flow (inflow, outflow) over the reporting period and zero otherwise. All regressions include primary investment objective and year dummies. The standard errors are clustered at the fund level and robust to heteroskedasticity. The symbols ***, **, and * represent statistical significance at the 1, 5, and 10 % level, respectively. I perform a Wald test to check whether each full effect for high level flows is different from zero and report the corresponding *p*-value at the bottom of the table. I report *p*-values in brackets

5 Conclusion

Using data collected from SEC N-SAR single-fund filings from registered investment companies over the period 1996 to 2009, I contribute two empirical findings. First, mutual funds with higher expense ratios do not necessarily pay higher brokerage commissions once unobservable fund heterogeneity is taken into account. Second, the documented negative relationship between brokerage commissions and fund performance is partly due to high levels of investor flows.

The common belief, which has been often perpetuated by the media, stands on cross-sectional analysis results from studies that report a positive and statistically significant relation between commissions and expense ratios. This positive relation is somewhat puzzling because most commissions include payments (soft dollars) for services other than portfolio transactions, services that would have been paid otherwise with expenses reported under the expense ratio. While my cross-sectional analyses also reveal this positive relation, my results from panel analyses show that an increase in expense ratios actually tends to decrease commissions. My finding suggests that it is not expense ratios per se that make commissions higher. There are other factors that cannot be measured in a straightforward way that tend to be correlated positively with expense ratios. Controlling for these unobserved "commissions increasing factors" by including fixed effects in the panel models for commissions helps to understand why there is no contradiction between the puzzling positive relation between expense ratios and commissions on the one hand, and the expectation that higher commissions should be associated with lower expense ratios on the other hand.

Most related studies report a negative and statistically significant relation between commissions and performance. I find that commissions paid by mutual fund managers are strongly influenced by investor flows and that the underperformance of higher commission funds is due (at least in part) to these flows. Specifically, for funds with lower levels of inflow (outflow), an increase of one standard deviation in commission ratios is related to an increase of 89.7 bps (55.1 bps) of annual abnormal return, indicating that higher commissions can add value. The underperformance is partially due to investor flows that force managers to trade, rather than poor governance or the use of soft dollars. Investor flows affect the composition of mutual fund portfolios and increase the frequency of trading, thus increasing transaction costs such as brokerage commissions. Fund managers are forced to engage in non-discretionary trading that may lead to suboptimal portfolios.

My findings raise the need to explore the characteristics of mutual funds within funds rather than just across funds. In addition, the availability and transparency of brokerage commissions and soft dollar data would not only help reduce investors' concerns about hidden fees, but also better disentangle the relation between expense ratios and commission ratios. Although, I show that flow-induced trades affect the relation between commissions and returns, due to data limitations, I do not control for other trading costs such as bid-ask spreads, market impact costs, and opportunity costs. More research is needed to better understand the precise interaction between investor flows and managers' trading patterns, and to what degree this interaction can explain the unresolved issues related to fund performance.

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