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# ESSAYS ON AGENCY CONFLICTS IN MUTUAL FUNDS

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## Dedication

*To my family*

# Abstract

This dissertation is comprised of three chapters that analyze agency conflicts in the U.S. mutual funds. The first chapter is an introduction.

In the second chapter, I assemble a unique dataset to examine outsourcing in the mutual fund industry. For the population of outsourced mutual funds I document that neither their performance nor their incentive structure differs significantly from mutual funds managed in-house. However, for a smaller sample of funds managed by advisors that concurrently have funds through in-house and outsourced contracts, I document significant under-performance of outsourced funds. Using return gaps and IPO allocations, I find support for the hypothesis that conflicts of interest lead advisors to favor their in-house funds over the funds they manage on behalf of unaffiliated companies. In contrast, I only find weak evidence for the alternative hypothesis that under-performance of outsourced funds is due to differences in risk taking behavior.

In the third chapter, I construct a new measure that tightens the link between stock return patterns around quarter-ends and the likelihood that these patterns result from mutual fund portfolio pumping. Both the level and the concentration of mutual fund ownership explain temporary stock price increases at the end of the quarter. I show that pumping is particularly pronounced among the best- and worst-performing funds and document a distinctive increase in this activity during the 1997–2001 period. The sharp decrease in portfolio pumping after 2001 is most likely due to academic and media attention that spawned investor activism and SEC enforcement actions. These changes in regulatory attention and scrutiny markedly affected the behavior of mutual fund managers.

# Contents

**Acknowledgments** **i**

**Dedication** **ii**

**Abstract** **iii**

**List of Tables** **vi**

**List of Figures** **viii**

**1 Mutual Funds and Agency Conflict in Mutual Funds** **1**

**2 Outsourcing in the Mutual Fund Industry** **5**

2.1 Introduction . . . . . 5

2.2 Related Literature . . . . . 8

2.3 Data Description . . . . . 10

2.4 Comparison of Outsourced and In-house Managed Funds in the Entire Sample . . . . . 12

2.4.1 Comparison of Performance . . . . . 12

2.4.2 Outsourcing and Propensity of Funds Being Shut Down . . . . 14

2.5 Outsourced and In-house Funds Managed by the Same Advisor . . . 16

2.5.1 Performance of Outsourced and In-housed Funds Managed by the Same Advisors . . . . . 17
2.5.2 Favoritism in Funds Managed by the Same Advisors . . . . . 18
2.5.3 Alternative Explanations . . . . . 22
2.6 Conclusion . . . . . 25

**3 Portfolio Pumping in the Mutual Fund Industry 43**
3.1 Measure Construction and Hypothesis Development . . . . . 46
3.1.1 Measuring Portfolio Pumping . . . . . 46
3.1.2 Hypothesis Development . . . . . 53
3.2 Data . . . . . 56
3.3 Results . . . . . 58
3.3.1 Evidence from fund-level regressions . . . . . 58
3.3.2 Evidence from stock-level regressions . . . . . 63
3.3.3 What caused the reduction in portfolio pumping? . . . . . 66
3.3.4 Increased regulatory scrutiny . . . . . 69
3.4 Competing Hypotheses . . . . . 70
3.4.1 Bull Market in the late 1990s . . . . . 70
3.4.2 Decimalization . . . . . 72
3.4.3 Window Dressing . . . . . 73
3.4.4 Competition among Market Makers . . . . . 74
3.4.5 Robustness Check . . . . . 75
3.5 Conclusion . . . . . 75

# List of Tables


2.1 **Outsourcing Over Time, Basic Charateristics and Sample Comparison** . . . . . 28

2.2 **Performance of Outsourced and In-house Managed Funds in Large Sample** . . . . . 30

2.3 **Outsourcing and Decision to Shut Down Funds** . . . . . 31

2.4 **Outsourced and In-house Funds Managed by the Same Advisor** 32

2.5 **Performance of Outsourced and In-house Funds Managed by Same Advisors** . . . . . 33

2.6 **Performance of Outsourced and In-house Funds Managed by Same Advisors for Matched Sample** . . . . . 34

2.7 **Return Gap of Outsourced and In-house Funds Managed by Same Advisors** . . . . . 35

2.8 **IPO Allocation and IPO Contribution to Performance** . . . . 36

2.9 **Risk Taking in Outsourced and In-house Funds Managed by Same Advisors - Deviation from Style** . . . . . 37

2.10 **Risk Taking in Outsourced and In-house Funds Managed by Same Advisors - Fund Specific Risk** . . . . . 39

2.11 **Clientele for Outsourced and In-house Funds Managed by Same Advisors** . . . . . 41

3.1 **Variables List for Chapter 3** . . . . . 78

3.2 **Fund Characteristics, Pumping Measures and Quarterly Series** 79

3.3 **Spearman Rank Correlations** . . . . . 80

3.4 **How Relative Fund Performance Pre/Post 2001 impacts Portfolio Pumping** . . . . . 81

3.5 **Economic Magnitude of Portfolio Pumping** . . . . . 83

3.6 **Price Pressure in Individual Stocks around Quarter-Ends Pre/Post 2001** . . . . . 84

3.7 **Price Pressure in Individual Stocks used in Restrictive Measure around Quarter-Ends Pre/Post 2001** . . . . . 86

3.8 **Stock Volume in the Last 30 Minutes of Quarters Pre/Post 2001** . . . . . 88

3.9 **Factiva News Stories Count** . . . . . 89

3.10 **Competing Hypotheses for the Decrease in Portfolio Pumping after 2001** . . . . . 90

3.11 **Robustness Check: Above Median Market Makers Pumping Measure, No Price Reserval Pumping Measure and High Turnover Sample** . . . . . 91

# List of Figures

3.1 **Changes in Portfolio Pumping over Time** . . . . . 92

3.2 **Portfolio Pumping by Investment Style and Period** . . . . . 93

# Chapter 1

# Mutual Funds and Agency Conflict in Mutual Funds

The U.S. mutual fund industry has been growing at a rapid pace over the last three decades. The industry now consists of more than 8,000 funds and combined assets of over $12 trillion, a remarkably difference from the early 1980s when there were over 500 mutual funds with total assets of about $134 billion. At the same time, the percentage of households owning mutual funds has grown from 6% to almost 44%.[1] Given the size and scope of the mutual fund industry, it is important to study the organizational structure of mutual funds and understand potential issues that mutual fund investors may face.

Under state law, a mutual fund is a corporation or a business trust in which investors are shareholders and third parties are in charge of business activities such as investing, underwriting, and accounting. Usually, a mutual fund is created by a sponsor, who invests seed money, chooses an advisor to manage the fund's assets,

[1] *Investment Company Factbook 2008*, available at http://ici.org/home/2008_factbook.pdf

assembles a group of third parties for back-office activities, and appoints a board of directors to oversee the fund. In addition, mutual funds and advisors are required to be registered with the Securities and Exchange Commission (SEC) under the Investment Company Act of 1940 and the Investment Advisor Act of 1940.

In a typical advisory contract between an advisor and a mutual fund, the advisor is compensated based on a percentage of assets under management, which depends on both returns on the investment and net in-flows to the fund. Unlike advisors, investors are mostly concerned about fund returns, not in-flows to the fund. Moreover, advisors do not share in losses that investors suffer. Thus, agency conflicts exist between advisors and investors because of the misalignment of their incentives.

It is argued that two mechanisms are in place to minimize agency conflicts between investors and advisors: one is through investors' ability to redeem their shares at net asset value any time or "vote with their feet" and the other is through board of directors.

Under the first mechanism, if investors think that advisors are not maximizing long-term fund returns with an appropriate level of risk, they can always redeem their shares and invest somewhere else, or "vote with their feet". In response, advisors, who do not want to lose those investors, will act in the best interest of investors. "Vote with their feet" is important for mutual funds because, unlike stock companies which are not directly affected when investors sell their shares, mutual fund share redemption directly reduces the size of funds. However, this mechanism is based on the premise that investors are active in managing their investment, a premise that does not always hold. Evidence from Sirri and Tufano (1998) and Christofferson and Musto (2002) shows that there exist passive investors who do not react to poor mutual fund performance. Thus, the "vote with their feet" mechanism does not

always minimize conflicts of interest between investors and advisors.

Boards of directors are supposed to represent investors to, among other duties, ensure investors' interest through higher returns, lower fees, and reasonable levels of risk. Though boards of directors in general are not involved in the day-to-day management of the mutual fund, they are expected to oversee advisor activities, to review fund performance, to negotiate advisory contracts, and to make sure of the fund's compliance with the federal securities laws. More importantly, boards of directors have the power to not renew the contract with the advisors if the advisors do not act in the best interest of investors. Thus, monitoring by boards of directors can reduce the likelihood of advisors acting in their own interests. However, research such as Meschke (2008) shows mixed evidence of board effectiveness.

The next two chapters of this dissertation show that agency conflicts between mutual fund investors and advisors exist and can significantly affect mutual fund investors. In the first essay, I show that advisors favor in-house over outsourced funds because in-house funds bring more revenues to advisors. Using return gaps and IPO allocations, I find support for the hypothesis that conflicts of interest lead advisors to favor their in-house funds over the funds they manage on behalf of unaffiliated companies. As a result, outsourced funds under-perform their in-house counterparts when managed by the same advisors.

In the second essay, I find evidence that mutual fund advisors inflate prices of stocks in their holdings by sending buy orders at quarter-ends to improve their quarterly performance, which leads to higher bonuses or lower propensity of being fired for advisors. Portfolio pumping harms long-term investors because it results in unnecessary transaction costs and the improvement in performance due to portfolio pumping likely reverses in the following quarter. I also show that pumping is particularly

pronounced among the best- and worst-performing funds and document a distinctive increase in this activity during the 1997–2001 period. The sharp decrease in portfolio pumping after 2001 is most likely due to academic and media attention that spawned investor activism and SEC enforcement actions.

# Chapter 2

# Outsourcing in the Mutual Fund Industry

## 2.1 Introduction

The growth of the U.S. mutual fund industry coupled with the increasing competition and a broader base of investors has led to many changes in the industry. Massa (2003) argues that large and diversified mutual fund families, such as Fidelity or T. Rowe Price, are not primarily competing through performance but rather through fees and the appeal of a broad range of products. As a result, more fund families are offering one-stop service, where investors can buy funds with various styles and fee structures.

For investors, one-stop service reduces search costs and portfolio rebalancing fees because fees are usually waived when switching funds within a family. For mutual fund families, one-stop service increases their competitive advantage and results in more stable assets under management because investors are more likely to switch to funds inside a family when they want to access different styles. Yet mutual fund families

also face challenges when they want to offer full lines of products because doing so may require fund families to manage funds not in their core styles. Sigglekow (2003) argues that fund families often lack the expertise in hiring and evaluating managers in styles other than their core styles. Outsourcing aims to overcome those challenges.

However, outsourcing in mutual funds can lead to behaviors from advisors that may not be in the best interest of mutual fund investors. It is well documented in the mutual fund literature that investors may suffer from conflicts of interest faced by their fund advisors. Brown, Harlow, and Starks (1996) document that underperforming fund managers increase their portfolio risk more than their peers; Gaspar et al. (2006) find evidence that mutual fund families favor some funds over others; Musto (1999) and O'Neal (2001) show that managers window dress their portfolios; Carhart et al. (2002) and Bernhardt and Davies (2005) document portfolio pumping by mutual fund managers.

In order to investigate potential agency conflicts between advisors and investors, I construct a novel dataset to examine potential conflicts of interest in outsourcing in the mutual fund industry. First, I compare the overall performance and the propensity to be shut down of outsourced versus in-house managed funds in a large sample. Chen, Hong, and Kubik (2007) document the under-performance of outsourced funds while Cashman and Deli (2006) claim similar performance between outsourced and in-house managed funds. With a panel dataset and a more precise classification of outsourced funds, I show that in-house managed and outsourced funds do not differ statistically in performance. I also find no evidence that outsourced funds are more likely to be shut down after poor performance, which Chen, Hong, and Kubik (2007) argue will occur due to the steeper incentives faced by outside managers.

To increase the power of the analysis, I focus on a sample of only outsourced and

in-house funds managed by the same advisors. This focused sample delivers a more powerful test because it controls for unobservable advisor effects better than the large sample. I find that outsourced funds under-perform funds managed in-house by the same advisor.

I examine two alternative hypotheses that may explain the under-performance of outsourced funds in the more focused sample. First, advisors may favor their in-house funds because in-house funds offer better incentives due to revenues other than advisory fee. To test this hypothesis, I compare return gaps, defined in Kacperczyk et al. (2008), as the difference between actual returns and hypothetical returns based on disclosed holdings, and initial public offerings (IPOs) allocations between outsourced and in-house managed funds. I find that outsourced funds have lower return gaps; since return gaps proxy for unobserved actions of managers to contribute to fund performance, the lower return gaps indicate potential transfer of performance from outsourced to in-house managed funds. Consistent with the above, I document that outsourced funds receive fewer IPO allocations and benefit less from IPOs than in-house funds. On the other hand, I observe only weak support for the alternative hypothesis that the under-performance of outsourced funds is the result of different risk-taking behavior between in-house and outsourced funds.

The paper proceeds as follow. Section 2.2 reviews recent research on outsourcing in mutual funds and their limitations. Section 2.3 describes sample construction and presents summary statistics. Section 2.4 examines the performance and closure propensity of outsourced funds in a large sample. Section 2.5 compares performance between outsourced and in-house funds managed by the same advisors and competing explanations for the difference. Section 2.6 concludes.

## 2.2 Related Literature

Outsourcing has been the subject of a large literature because of its increasing extent and scope. There are two major approaches in the outsourcing literature. The first approach examines the effects of asset ownership and its implications on firm integration. An example is Grossman and Helpman (2002) who expand the framework to the industry level to explain how industry characteristics affect integration. The second approach analyzes difference in behaviors due to organization forms. I adopt the second approach to study outsourcing in the mutual fund industry.

Two recent working papers examine outsourcing of mutual funds but both studies suffer from data limitations. Cashman and Deli (2006) classify outsourced funds based on the SEC's "Form ADV" filings. While their classification is trustworthy, their one-year cross-sectional dataset limits inferences about effects of outsourcing on fund performance.

Chen, Hong, and Kubik (2007) (hereafter CHK) overcome this limitation by using a panel dataset, but by comparing family names from the CRSP database and names of the first two advisors from the CDA Spectrum database, they are prone to misclassifying in-house managed funds as outsourced. CHK classify 26% of mutual funds as outsourced while Cashman and Deli (2006) report that 13.2% of funds are outsourced in 2003, and Baumol et. al. (1990) find that less than 15% of funds are outsourced in the early 1990s. The fraction reported by CHK is also higher than the estimate by New York State Attorney General Eliot Spitzer in his statement for a Senate Committee hearing about mutual funds.[1] Thus, potentially one in every two funds that CHK classify as outsourced are indeed managed in-house.

[1]State of New York Attorney General Eliot Spitzer Statement before the United States Senate Governmental Affairs Committee, January 27, 2004, available at http://hsgac.senate.gov/public/_files/012704spitzer.pdf

First, comparing family names and advisor names without checking their affiliation can lead to misclassification. For example, after the Bank of America and NationsBank merger, all Nations Funds that are managed by Bank of America should be classified as in-house managed because all parties are affiliated. However, if only comparing the names of the fund family and the advisor, Nations Funds would be classified as outsourced. Other examples are Van Kampen Funds advised by MSDW & Company, Scudder Funds advised by Deutsche Investment Management, and PIMCO Funds advised by Allianz Dresdner.

Second, CHK use "Form ADV" filings to check for the affiliation between fund sponsors and advisors. However, since "Form ADV" filings only report the latest affiliations and ignore historical information, thus using current classification for the earlier years can lead to misclassifications. For example, Marsico Capital Management had been sub-advising Bank of America Funds (Nation Funds) before Bank of America acquired a controlling interest of Marsico Capital Management in 1999 and completed the acquisition in June 2000. Since the "Form ADV"filing reports an affiliation between Marsico Capital Management and Bank of America, funds advised by Marsico Capital Management and Bank of America are never classified as outsourced according to CHK even though they were outsourced funds before 1999.[2]

[2]Reconstruction of CHK's sample is infeasible because variable names and codes of management companies for the CDA/Spectrum Mutual Funds Holding are no longer provided. From WRDS: "A prior version of the Mutual Funds Holdings database on WRDS included management company codes for matching to the 13f Institutional Holdings data for records starting in 1999. These codes are not included in this version. The feature is being re-evaluated to include more reliable code matching (many codes in 2000 were missing) and extend the matching before 1999."

## 2.3 Data Description

The panel dataset that I construct for my study overcomes these limitations by employing two unique data sources: annual filings for mutual funds (NSAR-B) required by the SEC which provide, among many fund characteristics, all advisor names for all funds, and Corporate Affiliations by LexisNexis, which identifies historical affiliations of advisors each year. If an advisor cannot be found in Corporate Affiliation, I go to its website and look at its history. Although all sources are publicly available, the dataset construction requires extensive manual collection and consolidation.

In particular, for each fund, I identify the advisors using NSAR filings. I then classify a fund as in-house managed if its advisors are all affiliated according to the Corporate Affiliation database or information on the advisor's website. Advisory firms are categorized as affiliated if they are owned by the same parent company or if one has controlling ownership interest in the others.

Subsequently, I merge the list of funds that are classified as outsourced or in-house managed with the CRSP database to obtain each fund's characteristics such as size, age, style, and returns. Because the CRSP database is at the share class level, I follow Kacperczyk et al. (2008) and aggregate different share classes of the same fund to create fund level data. Fund size is the total assets of all share classes and fund fees, turnover and returns are the size-weighted average of that of share classes. After creating fund level data, I employ a Python program and two procedures to improve the matching between CRSP fund names and NSAR fund names. First, I replace the common abbreviations in CRSP fund names by compiling a list of common abbreviations. Second, I construct NSAR fund names in two different ways that are similar to CRSP, where a fund name is just the the same as the reported fund name (e.g. Putnam Capital Opportunities Fund) and a fund name is the combination of

its trust name and the reported fund name, separated by a colon (e.g. Rydex Series Trust: Consumer Products Fund).

I identify advisors for the 50 largest mutual fund families and randomly select advisors from the remaining ones so that my sample includes a total of 1000 advisors. On average, each year, my sample includes the 50 largest mutual fund families and 220 smaller families. The inclusion of advisors for the 50 largest mutual fund families provides economic relevance while additional advisors from randomly selected smaller families maintain appropriate representation of the population for the sample.[3] My sample contains money market, bond, equity and international funds. However, for regression analyses, I only include domestic equity funds. The sample period starts in 1994, the year that NSAR forms are available from SEC's website for all mutual funds.

Panel A of Table 2.1 indicates that my sample covers roughly 38% of the funds and 55% of the assets under management of the CRSP's U.S. mutual fund universe. In this sample, outsourced funds comprise about 14% of the funds in the sample, which is consistent with Cashman and Deli's (2006) results and very different from 26% as reported in CHK. Also to be noted is that outsourcing is increasing over time in both number of funds and total assets under management.

Panel B of Table 2.1 shows that, on average, funds in my sample are larger and older, charge lower expenses, and have less turnover in comparison with those of CRSP universe. While they also seem to perform slightly better in all performance measures and have higher return gaps, the differences are insignificant.

Panel C compares the in-house managed sub-sample funds and the outsourced ones. The outsourced funds are younger, smaller in size, and charge on average

[3]To control for the potential difference in prevalence of outsourcing between bigger and smaller families, I use family size as one of the control variables in later regressions.

18 bps more than the in-house managed sub-sample. The difference in expenses might be well driven by the fact that funds in the outsourced sub-sample are smaller. This difference will be examined later in a multivariate framework where size as well as other factors such as style and age are taken into account. On average, outsourced funds significantly under-perform and have significantly lower return gaps in comparison with in-house managed ones.

## 2.4 Comparison of Outsourced and In-house Managed Funds in the Entire Sample

### 2.4.1 Comparison of Performance

CHK contend that it is harder for a sponsor to observe and monitor the effort of an outside manager relative to an inside manager. Therefore, managers of outsourced funds are more likely to be replaced after a period of poor performance because sponsors rely more on returns to evaluate outside managers. As a result, outside managers tend to deviate less in risk-taking behavior and outsourced funds should under-perform in-house managed funds. On the other hand, Cashman and Deli (2006) find similar performance between outsourced and in-house managed funds for one cross-sectional sample.

To compare the performance of outsourced funds and in-house managed funds, I regress monthly risk-adjusted performance on Outsourced, a dummy variable equal to 1 if a fund is outsourced and zero otherwise, and a set of control variables: the natural log of fund size, the natural log of family size, which is the total net assets of all funds in the family, fund age, turnover, and investment style dummies.

To adjust for systematic risk in fund returns, I use three different models: the CAPM model, the Fama-French 3-factor model, and the Carhart (1997) 4-factor model. In each model, for each fund in a given year, a set of coefficients is estimated by regressing monthly returns in excess of the risk-free rates on monthly factors of the previous three years. All regressions require at least 12 monthly return observations. Monthly risk-adjusted returns for that fund in that given year will be the difference between reported returns in excess of the risk-free rates and the expected returns in excess of the risk-free rates, which are based on the set of estimated coefficients and the monthly factors. In the CAPM model, the only factor is the CRSP value-weighted index return in excess of the monthly T-bill rate; the Fama-French 3-factor model uses two additional factors: SMB (Small Minus Big), which is the average return on the small portfolios minus the average return on the big portfolios, and HML (High Minus Low), which is the average return on the value portfolios minus the average return on the growth portfolios. Carhart 4-factor adjusted returns are estimated using the Fama-French 3 factors and a momentum factor, which is the average return on the high prior return portfolios minus the average return on the low prior return portfolios.[4] Because these factors are for domestic equity funds, I exclude money market, bond, and international funds in this analysis.

Table 2.2 shows that the coefficients for Outsourced for all three measures of risk-adjusted returns are not significant at standard levels. The result is similar to Cashman and Deli's (2006), who show in a cross-section of funds no difference in risk-adjusted performance between outsourced and in-house managed funds. However, my finding differs from that of by CHK, who report statistically difference in performance

[4]I thank Kenneth French for making the factors and their detailed description available at his website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html .

between outsourced and in-house managed funds.[5]

Next, I compare return gaps between outsourced and in-house managed funds. Return gaps, calculated similarly to Kacperczyk et al. (2008), are the difference between fund's actual returns and buy-and-hold returns based on the latest disclosed holding. More specifically, for each month, a fund's holding return is calculated using the latest disclosed holding information and individual stock returns in-between months. Monthly return gaps are the difference between funds' actual returns and the sum of holding return and monthly expenses. Kacperczyk et al. (2008) argue that return gaps proxy for the unobserved actions of fund managers that affect fund performance. They show that there is a persistence in return gaps and that portfolios of high return gaps out-perform ones of low return gaps. In other words, investors are better off if their funds have higher return gaps.

The last column of Table 2.2 compares the difference in return gaps between in-house and outsourced funds. The coefficients for outsourced is negative and significant at the 10% level, suggesting smaller return gaps for outsourced funds in the large sample.

### 2.4.2 Outsourcing and Propensity of Funds Being Shut Down

CHK argue that there exists a conflict of interest between an outside advisor and the advisory firm. They propose that outside advisors, because of the lack of monitoring, are more likely to be fired after poor performance. Thus, they will deviate less in risk-taking behavior, resulting in under-performance for outsourced funds. CHK's argument is in the spirit of Chevalier and Ellison (1999), who document that younger managers deviate less in risks because of a higher propensity of being fired.

[5]The sample period is 1994–2004, which is the same as CHK's sample period.

The previous results show little support for the under-performance of outsourced funds. To further examine their argument, I repeat CHK's test using my sample by running probit regressions where the dependent variable is Closure, a dummy equal to 1 if a fund no longer exists next year, as defined in CHK. These are funds that were either liquidated or merged out of existence, and hereafter will be referred as being shut down. Independent variables include the dummy variable Outsourced, annual risk-adjusted return, and a similar set of control variables: the natural log of fund size, the natural log of family size, turnover, and investment style dummies. For risk-adjusted return, I use CAPM, Fama-French 3-factor and Carhart's 4-factor models.

Similar to CHK, I find that the coefficient for risk-adjusted returns the year prior to being shut down is strongly negative, indicating that funds are much more likely to be closed after a poor performance. This result is strong regardless of the method to adjust returns. I also find that smaller funds and funds from larger families are more likely to be closed. However, in contrast to CHK's finding, Table 2.3 shows that the coefficients for Outsourced are not significant at any standard level.

To further examine the effect of outsourcing in the decision to shut down funds, I include the interaction of risk-adjusted returns with Outsourced. The interaction terms test for the sensitivity to performance of the effect of outsourcing on the shut down decision. Again, the interaction terms are not significant for all measures of adjusted returns.

## 2.5 Outsourced and In-house Funds Managed by the Same Advisor

A sharper test for conflicts of interest is in a setting where an advisor manages two funds – one in an in-house contract and the other one in an outsourcing contract. In this setting, I can examine the advisory firm's different treatment of these two funds and how those behaviors affect funds returns. This is similar to analyses by Gaspar et al. (2006), who show evidence in IPO allocations and cross-trades that fund families strategically transfer performance to favored funds. Strategic behaviors of advisors are also suggested by Cici et al. (2007), who document that mutual funds managed by advisors with hedge funds suffer in performance because advisors favor hedge funds over mutual funds.

There are several reasons why in-house funds might be favored by an advisor. First, since outsourced funds are usually smaller in size than their in-house counterparts and revenue is a direct function of assets under management, an increase in performance of in-house funds generate more revenue to the advisor. Second, in-house managed funds contribute to an advisory firm's profit through other expenses such as 12-b1 fees, whereas the only revenue to an advisor from outsourced funds is advisory fees.

All else equal, if in-house funds receive favorable treatment, they are likely to outperform outsourced funds. There are many ways that an advisor can transfer performance to more favored funds. For example, Gaspar et al. (2006) show evidence that favored funds receive more hot IPO allocations and have better opposite trades. Cici et al. (2007) document that mutual funds are allotted fewer IPOs than hedge funds managed by the same advisory firm.

I construct a sample of funds that are managed by the same advisor through both in-house and outsourced contracts. For each year, using NSAR filings, I identify advisory firms that manage funds both as advisor and sub-advisor. I require that funds managed by these firms as advisors be in-house managed and funds managed by these firms as sub-advisors be outsourced. The outsourced and in-house managed classification follows the procedure described in section 2.3. The sample period is also from 1994–2004. Bond and money market funds are again excluded from the sample.

Summary statistics for this sample are displayed in Table 2.4. On average, for every outsourced fund, there are 6 in-house funds managed by the same advisor in the same year. Similar to the larger sample, outsourced funds are smaller in size, have higher expenses, are younger, have lower turnover, and have lower adjusted returns. All the differences are significant.

### 2.5.1 Performance of Outsourced and In-housed Funds Managed by the Same Advisors

To examine the difference in performance between in-house and outsourced funds managed by the same manager, I run OLS regression with robust standard errors clustered by advisory firm and time dummies. [6] As Petersen (2008) shows, clustering of errors by advisors controls for correlation of errors within advisors. If outsourced funds under-perform in-house managed funds, I should find a negative coefficient for Outsourced, an indicator variable equal to 1 if the fund is outsourced. The set of controls are the same as before, the fund expenses, fund age, turnover, the natural log of fund size, the natural log of family size, and investment style dummies.

[6] Significance of the coefficients is either the same or stronger when no clustering is imposed on standard errors

The dependent variable in the first column of Table 2.5 is unadjusted reported monthly returns. In this regression, the coefficient of Outsourced is -9.26 bps, indicating that outsourced funds have lower returns than their in-house counterparts. The next three columns of Table 2.5 show results for different measures of risk-adjusted returns. The Outsourced coefficients are negative for each of the four measures of risk-adjusted returns, indicating an under-performance by outsourced funds. The under-performance varies from 7.8 bps to 10.6 bps on a monthly basis or around 1% annually. The Outsourced coefficients are significant at the 5% for CAPM and Carhart 4-factor adjusted returns, and at the 1% level for Fama-French 3-factor adjusted returns. These show that under-performance by outsourced funds is both economically and statistically significant in a sample of outsourced and in-house managed funds managed by the same advisors.

To provide further evidence of the under-performance of outsourced funds, I construct a matched sample of outsourced and in-house managed funds. Specifically, each outsourced fund is matched with an in-house fund which is managed by the same advisor, has the same investment style as classified by CRSP, and is closest in total net assets. Table 2.6 presents results of the same regressions as in Table 2.5 on the matched sample. The coefficients for Outsourced are larger in magnitude in comparison with those in Table 2.5 but remain negative and statistically significant. Overall, I find clear evidence that outsourced funds under-perform in-house managed funds managed by the same advisors.

### 2.5.2 Favoritism in Funds Managed by the Same Advisors

There are several hypotheses that potentially can explain the under-performance of outsourced funds in comparison with in-house managed ones when they are managed

by the same advisors. Gaspar et al. (2006) show evidence of favorable treatment for funds that are more valuable to the fund families. In this section, I investigate potential favoritism by examining the difference in return gaps and IPO allocation between funds managed by the same advisors.

First, I compare return gaps between outsourced and in-house funds managed by the same advisors. Return gaps, defined in Kacperczyk et al. (2008) as the difference between funds' actual returns and buy-and-hold returns based on the latest disclosed holding, proxy for unobserved actions of mutual fund managers that affect fund returns. If outsourced funds are treated less favorably than in-house managed funds, I should find lower return gaps for outsourced funds. To test this hypothesis, I use OLS regression with return gaps as the dependent variable and the same set of controls as the performance analysis in the previous section. Robust standard errors are clustered by advisory firms and time dummies also are included.

The first column of Table 2.7 indeed shows lower return gaps for outsourced funds. The coefficient for Outsourced is negative and significant at the 1% level; its magnitude is about 8bps on a monthly basis. This finding shows that the under-performance of outsourced funds documented in the previous section is driven almost entirely by the lower return gaps. In other words, the under-performance could mostly be due to the advisor's differential treatment between outsourced and in-house managed funds. For the matched sample, as indicated in the second column of Table 2.7, the coefficient for Outsourced is negative and significant at the 10% level, which further supports that outsourced funds have lower return gaps in comparison to in-house managed funds.

Next, I compare the IPO allocations between outsourced and in-house funds managed by the same advisors. If in-house funds are favored, they might receive more

IPO allocations and benefit more from those IPOs.

I collect all IPOs from 1994 to 2004 from SDC and identify IPO stocks that are in holdings of funds disclosed within 90 days of the issuance date. For the stock level, I calculate the Allocation of IPO stocks to funds where the allocation is defined as the fraction of IPO stocks to funds' total net assets. Specifically, for each IPO stock, I identify funds in my sample that hold the stock at the end of the quarter after its issuance. The Allocation of the IPO stock is the product of the number of shares of the stock and the price of the stock at quarter ends divided by the total net assets of the funds. At the fund level, I calculate two measures to gauge the effect of differential treatment in IPOs. The first is Allocation of IPO stocks, defined as the total Allocation of all IPO stocks that a fund holds at the end of the quarter after their issuance. Similar to Gaspar et al. (2006), the second measure is the contribution of IPOs to the performance of funds, defined as the returns on the first day of IPO stocks times the fraction of those IPO stocks in funds' total net assets. I also recalculate these measures for hot IPOs only, where hot IPOs, as in Reuter (2006), are ones that have positive first day returns.

Table 2.8 shows the comparison between outsourced funds and in-house managed funds for those measures. For the stock level, on average, an IPO stock accounts for 31.49 basis percentage points of the total net assets of an in-house fund where as it accounts for 25.59 basis percentage points of an outsourced fund. The difference is significant at the 1% level. Results for only hot IPOs are almost the same. For the fund level, on average, in-house managed funds allocate 1.35% of their assets to IPO stocks whereas outsourced funds allocate 1.13% of their assets to IPOs. The difference is statistically significant at the 5% level. Once again, the finding is similar if only hot stocks are considered. These results indicate evidence of different IPOs

allocations between in-house and outsourced funds.

Table 2.8 also reports that in-house funds receive on average 36.94 bps in performance from IPOs while outsourced funds earn 35.36 bps. Even though the difference is not significant, outsourced funds appear to benefit less from IPO allocations. Likewise, for sample of only hot IPOs, outsourced funds receive a smaller contribution to performance.

It is noted that this IPO allocation analysis is biased against finding differences between in-house and outsourced funds due to the infrequency of reported holdings. For example, if only in-house funds are allocated shares of IPOs and managers hide the inferior treatment to outsourced funds by buying shares of the IPO stocks after the issuance, I would not observe the difference in IPOs allocation between in-house and outsourced funds. It is even possible that managers move IPO stocks from in-house to outsourced funds after the issuance, which harms outsourced funds because IPO stocks, as documented in Ritter(2001), typically under-perform in the years following the IPO.

The finding that outsourced funds under-perform their in-house counterparts due to differences in IPO allocations complements the literature on strategic behavior of mutual fund advisory firms that affects investors. Cici et al. (2007) document that mutual funds managed by advisory firms which concurrently run hedge funds under-perform because hedge funds received preferential treatment due to their better compensation. Nohel et. al. (2008), on the other hand, show that advisory firms try to retain good managers by allowing them manage hedge funds at the same time and that funds managed by these managers significantly out-perform peer funds.

### 2.5.3 Alternative Explanations

#### Difference in Risk Taking Behavior

Economic theory predicts that managers behave differently when facing different incentives. Chevalier and Ellison (1999), in particular, show that younger managers take on less risk because they have higher propensity of being fired after poor performance. CHK apply this argument and claim that under-performance of outsourced funds is the result of different risk-taking behavior by managers. I evaluate this argument by calculating two measures of risk-taking behaviors used by and compare that of outsourced and in-house managed funds.

The first measure is the fund's deviation of systematic risk from its style. In particular, for each year, monthly fund excess returns (measured as the excess over the 3-month T-bill rate) are regressed on monthly market premiums, which are the difference between market returns (proxied by CRSP value-weighted index returns) and 3-month T-bill rates. A fund's systematic risk deviation from its style for each year is the natural log of the absolute difference between its estimated beta and the mean beta of all other funds in its investment style for that year.

The second measure is the fund's deviation of idiosyncratic risk from its style. The same regression for systematic risk is employed, but, instead of the beta coefficient, the sum of residual standard deviation is analyzed. A fund's deviation of idiosyncratic risk from its style is the natural log of the absolute value of the difference between its idiosyncratic risk and the average of this value for all funds in its style.

The two columns of Table 2.9 show that the coefficient for Outsourced are negative and significant at the 5% level for deviation of systematic risk. However, this coefficient is not significant for deviation of idiosyncratic risk. To further investi-

gate, I also calculate fund's deviation of systematic and idiosyncratic risk by using Carhart's 4-factors instead of only market premiums in the regression to estimate fund systematic and idiosyncratic risk. As documented in Column 3 and 4 of Table 2.9, the coefficient for Outsourced are no longer significant. These findings show that outsourced funds appears to deviate from systematic risk less than in-house managed funds but there is no statistical difference in deviation of idiosyncratic risk between the two groups.

I employ another measure to gauge the deviation in risk taking behavior, which is $R^2$ values from annual regressions of monthly fund returns on the average of monthly returns of all funds in the same style. Once again, as reported in the last column of Table 2.9, the coefficient for Outsourced is not significant.

I also compare the holdings-based betas and the factor loadings of outsourced and in-house funds managed by the same advisors to further investigate potential differences in their risk-taking behaviors. Holdings-based betas are the value-weighted average of betas of stocks in funds' holdings. Factor loadings are the coefficients for Small Minus Big, High Minus Low, and Momentum factors, estimated as in Carhart's (1997) 4-factor model. Table 2.10 shows that the coefficients for Outsourced are not significant for all risk-taking measures except for Small Minus Big factor loadings, which suggests that outsourced and in-house funds managed by the same advisors do not have statistically significant differences in their risk-taking behaviors. This is also consistent with the earlier finding that outsourced funds under-perform in-house managed ones in both adjusted and un-adjusted returns.

**Difference in Clientele**

Another potential explanation for the under-performance of outsourced funds in comparison with in-house managed ones is that they have different clientele. To examine this argument, I calculate three different measures for clientele characteristics.

Since Sirri and Tufano (1998) document a convex relation between fund flow and performance, I calculate two measures: the first one is the sensitivities of monthly flows following positive CAPM risk-adjusted monthly returns and the second measure is the sensitivities of monthly flows following negative CAPM risk-adjusted monthly returns. In particular, for each fund year, the sensitivity of flow on positive return is the coefficient obtained when I regress all the following month fund flows normalized by fund's TNA on all positive risk-adjusted monthly returns of the last five years for that fund. A minimum of six observations is required for all regressions. The sensitivity of flow on negative return is similarly calculated except that negative risk-adjusted monthly returns were used instead. Similarly, another pair of measures are calculated using Carhart's 4-factor instead of CAPM risk-adjusted monthly returns.

Another measure is investors attrition, calculated as the fraction of assets has been withdrawn since a fund reached its maximum size. For each fund year, the measure is defined as the difference between the fund's largest TNA since its inception adjusted by accumulated returns and the fund's TNA at year-end normalized by the fund's TNA at year-end. This measure is proposed by Christofferson and Musto (2002), who argue that investors attrition reflects invetors' sensitivity to fund expenses and performance, thus can be used as a proxy for clientele characteristics of funds.

Table 2.11 compares the five different measures for clientele characteristics between outsourced and in-house managed funds. The coefficients for Outsourced is mostly insignificant, thus these tests do not show strong evidence of clientele differences

between outsourced and in-house funds managed by the same advisors.

Overall, there appears to be only weak evidence of the difference in risk-taking and clientele characteristics between outsourced and in-house managed funds. Even though this hypothesis cannot be ruled out, the result from analyses of return gap and IPO allocations offers stronger evidence that the under-performance is a result of favorable treatment of in-house funds when managed together with outsourced funds.

## 2.6 Conclusion

One-stop service, where mutual fund families offer funds of various styles to investors, is becoming more popular. Such families allow investors to save search costs and switching fees if they want to switch to funds with different styles. Because investors are more likely to switch to funds inside a family when they want to access different styles, one-stop service also benefits mutual fund families by making their fee income more stable. In order to offer one-stop service of various styles, fund families may need to rely on outsourcing.

My paper examines the performance and potential conflicts of interest of outsourced funds by constructing a unique panel dataset of mutual funds. Other papers that look into outsourced funds have data limitations. Cashman and Deli (2006) analyze outsourced funds but their sample contains only one year of observations, thereby limiting the inferences can be drawn. CHK have a panel dataset but suffers from potentially significant misclassification of outsourced vs. in-house managed funds.

First, I analyze the performance of all outsourced funds. Cashman and Deli (2006) find that outsourced funds have performance similar to in-house managed funds. In

contrast, CHK contend that outsourced funds under-perform because outside advisors take less risk when facing a steeper incentive schedule. I find that outsourced funds do not statistically under-perform nor over-perform in-house managed ones.

I re-examine CHK's hypothesis that outsourced funds are more likely to be closed after a period of poor performance, which is a steeper incentive schedule that outside managers face. Contradicting CHK, I do not find in my sample that outsourced funds are more likely to be closed after a period of under-performance.

However, when comparing outsourced funds managed by an advisory firm that concurrently manages in-house funds, I find that outsourced funds under-perform in-house managed funds after controlling for size, styles, and other fund's characteristics. This finding suggests a favorable treatment of in-house managed funds, which is a rational behavior of advisory firms since outsourced funds bring in less revenues for the same increase in performance and there are no other benefits other than management fees from outsourced funds.

I show evidence of favoritism for in-house funds by advisory firms by reporting lower return gaps, a measure of unobserved actions of managers that are potentially valuable to funds, for outsourced funds. The lower return gaps for outsourced funds can be a result of managers placing in-house funds' buy and sell orders in front of the outsourced funds to receive better transaction prices or managers allocating more IPOs to in-house funds. Analyses of IPO allocations reveal that outsourced funds receive smaller IPO allocations and benefit less from IPOs in comparison to in-house managed funds. These findings compliment the literature on strategic behavior of advisory firms that affect mutual fund investors.

I also consider alternative hypotheses, which argue that differences in risk-taking behaviors and investor clientele result in the under-performance by outsourced funds.

Using different measures for risk-taking behaviors and clientele, I find some evidence that outsourced funds take less risk and have different clientele in comparison with in-house managed funds. However, these results are mixed and mostly insignificant.

Table 2.1: **Outsourcing Over Time, Basic Charateristics and Sample Comparison**

Panel A reports the trend and scope of outsourcing over time; Panel B and Panel C report summary statistics and comparison of CRSP population of funds and in-house and outsourced sample. The means and medians in Panel B and Panel C are for the pooled sample over the entire sample period. TNA is the total net assets; expenses is the operating expenses; CAPM alpha, 3-factor alpha, and 4-factor alpha are risk adjusted annualized return using CAPM, Fama-French 3-factor and Carhart's 4-factor model. In each model, for each fund in a given year, a set of coefficients is estimated by regressing monthly returns in excess of the risk-free rates on monthly factors of the previous three years. All regressions require at least 12 monthly return observations. Monthly risk-adjusted returns for that fund in that given year will be the difference between reported returns in excess of the risk-free rates and the expected returns in excess of the risk-free rates, which are based on the set of estimated coefficients and the monthly factors. In the CAPM model, the only factor is the CRSP value-weighted index return in excess of the monthly T-bill rate; the Fama-French 3-factor model uses two additional factors: SMB (Small Minus Big), which is the average return on the small portfolios minus the average return on the big portfolios, and HML (High Minus Low), which is the average return on the value portfolios minus the average return on the growth portfolios. Carhart 4-factor adjusted returns are estimated using the Fama-French 3 factors and a momentum factor, which is the average return on the high prior return portfolios minus the average return on the low prior return portfolios. Annualized return gaps are based on monthly return gaps, calculated as in Kacperczyk et al. (2008). More specifically, for each month, a fund's holding return is calculated using the latest disclosed holding information and individual stock returns in-between months. Monthly return gaps are the difference between funds' actual returns and the sum of holding return and monthly expenses. Reported t-test statistics are for test of the difference between means of samples, Rank Test reports z-values for Wilcoxon-Mann-Whitney two-sample rank-sum test, and *,**,*** respectively denote significance at 10%, 5%, 1% level.

**Panel A: Outsourcing Over Time and Comparison**

| | CRSP | | Sample | | | Outsource | | |
|---|---|---|---|---|---|---|---|---|
| Year | Number of Funds | Total Assets | Number of Funds | Pct of Funds | Pct of Assets | Number of Funds | Pct of Funds | Pct of Assets |
| 1994 | 5437 | 2,023,162 | 2011 | 36.99 | 54.22 | 261 | 12.98 | 6.95 |
| 1995 | 5446 | 2,582,820 | 2046 | 37.57 | 55.40 | 278 | 13.59 | 6.45 |
| 1996 | 5410 | 3,116,701 | 2054 | 37.97 | 55.92 | 248 | 12.07 | 6.08 |
| 1997 | 6027 | 3,959,618 | 2276 | 37.76 | 55.92 | 268 | 11.78 | 6.23 |
| 1998 | 6109 | 4,809,738 | 2322 | 38.01 | 56.34 | 267 | 11.50 | 6.83 |
| 1999 | 6254 | 5,857,434 | 2392 | 38.25 | 56.17 | 300 | 12.54 | 6.83 |
| 2000 | 6387 | 5,921,771 | 2437 | 38.16 | 56.31 | 317 | 13.01 | 7.53 |
| 2001 | 6458 | 5,983,918 | 2534 | 39.24 | 57.11 | 347 | 13.69 | 7.42 |
| 2002 | 6317 | 5,531,165 | 2499 | 39.56 | 56.34 | 364 | 14.57 | 7.30 |
| 2003 | 6614 | 6,535,095 | 2625 | 39.69 | 57.04 | 419 | 15.96 | 8.78 |
| 2004 | 6916 | 7,276,600 | 2669 | 38.59 | 56.53 | 448 | 16.79 | 9.54 |

**Panel B: Sample vs. CRSP**

| | CRSP | | Sample | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | t-test | Rank Test |
| TNA (million $) | 780.62 | 135.05 | 1,152.73 | 202.58 | -16.38*** | -63.75*** |
| Expenses (%) | 1.10 | 1.00 | 1.02 | 0.93 | 16.33*** | 24.24*** |
| Fund Age (month) | 110.51 | 84.00 | 114.11 | 84.00 | -4.69*** | -34.75*** |
| Turnover | 0.93 | 0.53 | 0.88 | 0.52 | 3.62*** | 3.88*** |
| Raw Return (bps) | 9.24 | -12.40 | 13.90 | -8.84 | -0.92 | -7.28*** |
| CAPM alpha (bps) | 9.24 | -12.40 | 13.90 | -8.84 | -0.92 | -2.65*** |
| Fama-French alpha (bps) | -76.68 | -61.34 | -70.99 | -57.01 | -1.25 | -2.45** |
| Carhart alpha (bps) | -176.45 | -169.84 | -171.88 | -163.46 | -1.00 | -1.38 |
| Return Gap (bps) | 24.37 | 3.19 | 26.34 | 8.93 | -0.23 | -1.88* |

**Panel C: Outsourced vs. In-house Managed Funds**

| | In-House Funds | | Outsourced Funds | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | t-test | Rank Test |
| TNA (million $) | 1,231.54 | 212.10 | 654.05 | 146.95 | 8.23*** | 11.50*** |
| Expenses (%) | 1.00 | 0.91 | 1.18 | 1.09 | -19.45*** | -8.75*** |
| Fund Age (month) | 118.31 | 84.00 | 87.57 | 60.00 | 16.90*** | 11.88*** |
| Turnover | 0.89 | 0.51 | 0.81 | 0.59 | 2.42** | 6.55*** |
| Raw Return (bps) | 995.81 | 1119.09 | 781.36 | 964.65 | 2.93*** | 2.51** |
| CAPM alpha (bps) | 20.98 | -7.39 | -32.17 | -23.66 | 4.34*** | 1.45 |
| Fama-French alpha (bps) | -63.12 | -54.40 | -122.63 | -79.21 | 5.55*** | 3.41*** |
| Carhart alpha (bps) | -168.16 | -164.97 | -196.34 | -154.26 | 2.50** | 2.47** |
| Return Gap (bps) | 34.33 | 12.11 | -21.12 | -12.38 | 1.95* | 3.59*** |

Table 2.2: **Performance of Outsourced and In-house Managed Funds in Large Sample**

This table reports OLS regression results of performance for the large sample. Dependent variable are CAPM, 3-factor, and 4-factor monthly risk adjusted returns and return gaps (as in Table 2.1). Outsourced is a dummy variable equal to 1 if the fund is outsourced. Fund Size is the fund's total net assets at the beginning of the month, expenses is the monthly operating expenses, Family Size is the total net assets of funds in the same family at the beginning of the month. AggrGr, Growth, Gr & Inc, and Sector are dummies for style. Standard errors are clustered by funds, time dummies are included but not reported, t-stats are reported in brackets and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | CAPM alpha | Fama-French alpha | Carhart alpha | Return Gap |
|---|---|---|---|---|
| Outsourced | -3.4961 | -3.4605 | -3.3536 | -4.0988* |
| | [-0.92] | [-1.17] | [-1.22] | [-1.95] |
| ln(Fund Size) | 4.4548*** | 4.2411*** | 2.4068*** | -1.6675** |
| | [4.20] | [4.97] | [3.16] | [-2.34] |
| Expenses | -6.8512*** | -9.1281*** | -8.2449*** | -4.1675*** |
| | [-4.17] | [-5.70] | [-6.94] | [-2.72] |
| Fund Age | -0.0414*** | -0.0357*** | -0.0291*** | -0.0024 |
| | [-5.19] | [-6.71] | [-5.32] | [-0.82] |
| Turnover | 2.3373 | 2.3073 | -1.2372 | 0.9090 |
| | [1.25] | [1.52] | [-0.70] | [0.74] |
| ln(Family Size) | -1.1180 | -0.9026 | -0.8758 | 0.7973 |
| | [-1.29] | [-1.33] | [-1.08] | [1.37] |
| AggrGr | -3.0227 | 5.8805 | -5.5096 | 6.4024 |
| | [-0.40] | [0.89] | [-0.82] | [1.51] |
| Growth | 0.9011 | 0.1815 | -4.4980** | 2.6886 |
| | [0.39] | [0.10] | [-2.30] | [1.57] |
| Gr & Inc | 1.6387 | 1.2694 | 1.9800 | 2.0899 |
| | [0.72] | [0.65] | [1.00] | [1.27] |
| Sector | 15.7565*** | 8.9740* | 6.3785 | 7.7178** |
| | [2.64] | [1.78] | [1.22] | [2.29] |
| Constant | -11.6467 | 1.3823 | 28.7976*** | 27.9884*** |
| | [-0.88] | [0.13] | [2.68] | [3.16] |
| Adj. $R^2$ | .0620 | .0546 | .0576 | .0059 |
| Observations | 79932 | 79932 | 79932 | 66935 |

Table 2.3: **Outsourcing and Decision to Shut Down Funds**

This table reports probit regression results for the entire sample. The dependent variable equals to 1 if the fund is shut down next year. Risk-adj. Return are risk adjusted returns using the CAPM (the first two columns), Fama-French 3-factor (the middle two columns) and Carhart's 4-factor (the last two columns) models (as described in Table 2.1). Outsourced is a dummy varible equal 1 if the fund is outsourced. Risk-adj. x OS is the interaction term between Risk-adj. and Outsouced. Fund Size is the fund's total net assets at year-end, expenses is the operating expenses, Family Size is the total net assets of funds in the same family at year-end. AggrGr, Growth, Gr & Inc, Sector are dummies style. Standard errors are clustered by funds, t-stats are reported in brackets and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | **CAPM alpha** | | **Fama-French alpha** | | **Carhart alpha** | |
|---|---|---|---|---|---|---|
| Outsourced | -0.1250 | -0.1070 | -0.1361 | -0.1287 | -0.1407 | -0.1570 |
| | [-1.36] | [-1.12] | [-1.48] | [-1.31] | [-1.53] | [-1.56] |
| Risk-adj. Return | -1.9139*** | -1.9807*** | -2.2024*** | -2.2255*** | -2.3164*** | -2.2648*** |
| | [-6.27] | [-6.12] | [-6.49] | [-6.18] | [-6.58] | [-6.10] |
| Risk-adj. × OS | | 0.4849 | | 0.1651 | | -0.3502 |
| | | [0.55] | | [0.17] | | [-0.35] |
| ln(Fund Size) | -0.2928*** | -0.2931*** | -0.2894*** | -0.2895*** | -0.2922*** | -0.2921*** |
| | [-14.49] | [-14.49] | [-14.29] | [-14.28] | [-14.40] | [-14.41] |
| Expenses | -5.4868* | -5.5015* | -6.3364* | -6.3318* | -6.1011* | -6.1091* |
| | [-1.65] | [-1.65] | [-1.88] | [-1.87] | [-1.84] | [-1.84] |
| Fund Age | 0.0002 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| | [0.69] | [0.70] | [0.63] | [0.64] | [0.65] | [0.65] |
| Turnover | 0.0275 | 0.0273 | 0.0268 | 0.0268 | 0.0214 | 0.0216 |
| | [1.11] | [1.10] | [1.04] | [1.04] | [0.85] | [0.85] |
| ln(Family Size) | 0.0629*** | 0.0631*** | 0.0588*** | 0.0589*** | 0.0585*** | 0.0584*** |
| | [4.03] | [4.04] | [3.78] | [3.77] | [3.76] | [3.75] |
| AggrGr | -0.0316 | -0.0322 | -0.0151 | -0.0153 | -0.0376 | -0.0373 |
| | [-0.23] | [-0.24] | [-0.11] | [-0.11] | [-0.28] | [-0.28] |
| Growth | -0.2220** | -0.2233** | -0.2300*** | -0.2302*** | -0.2390*** | -0.2387*** |
| | [-2.49] | [-2.50] | [-2.59] | [-2.59] | [-2.69] | [-2.69] |
| Gr & Inc | -0.0701 | -0.0708 | -0.0725 | -0.0726 | -0.0722 | -0.0720 |
| | [-0.76] | [-0.77] | [-0.79] | [-0.79] | [-0.79] | [-0.78] |
| Sector | -0.4411*** | -0.4428*** | -0.4417*** | -0.4419*** | -0.4447*** | -0.4444*** |
| | [-3.50] | [-3.51] | [-3.51] | [-3.50] | [-3.55] | [-3.54] |
| Constant | -0.7810*** | -0.7830*** | -0.7577*** | -0.7591*** | -0.7386*** | -0.7357*** |
| | [-4.83] | [-4.84] | [-4.68] | [-4.68] | [-4.56] | [-4.53] |
| Pseudo $R^2$ | .1403 | .1404 | .1381 | .1381 | .1389 | .1390 |
| Observations | 6663 | 6663 | 6663 | 6663 | 6663 | 6663 |

Table 2.4: **Outsourced and In-house Funds Managed by the Same Advisor**

This table reports summary statistics for a sample of funds that have advisors who manage outsourced and in-house funds concurrently. CAPM-alpha, 3-factor alpha, and 4-factor alpha are risk adjusted return using the CAPM, Fama-French 3-factor and Carhart's 4-factor models (as described in Table 2.1). Reported t-test statistics are for test of the difference between means of samples, Rank Test reports z-values for Wilcoxon-Mann-Whitney two-sample rank-sum test, and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | **In-House Funds** | | **Outsourced Funds** | | **Difference** | |
|---|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | t-test | Rank Test |
| TNA (million $) | 1431.79 | 322.43 | 518.61 | 139.45 | 5.80*** | 11.17*** |
| Expenses (%) | 1.25 | 1.20 | 1.43 | 1.28 | -6.46*** | -8.87*** |
| Fund Age (month) | 153.06 | 95.00 | 100.65 | 71.00 | 7.19*** | 9.40*** |
| Turnover | 1.11 | 0.77 | 0.88 | 0.60 | 2.00** | 4.42*** |
| Raw Return (bps) | 878.61 | 1001.95 | 603.92 | 809.28 | 3.11*** | 2.68*** |
| CAPM alpha (bps) | 60.48 | -73.21 | -65.80 | -188.57 | 2.01** | 3.58*** |
| Fama-French alpha (bps) | -80.05 | -154.82 | -235.48 | -193.87 | 3.11*** | 3.59*** |
| Carhart alpha (bps) | -121.85 | -157.08 | -235.01 | -181.13 | 2.49*** | 3.41*** |
| Return Gap (bps) | 53.72 | 32.86 | -34.45 | -13.91 | 2.57*** | 4.30*** |

Table 2.5: **Performance of Outsourced and In-house Funds Managed by Same Advisors**

This table reports OLS regression results of performance for sample of in-house and outsourced funds managed by same advisors. CAPM alpha, 3-factor alpha, and 4-factor alpha are risk adjusted return using CAPM, Fama-French 3-factor and Carhart's 4-factor model (as described in Table 2.1). Outsourced is a dummy variable equal to 1 if the fund is outsourced. Fund Size is the fund's total net assets at the beginning of the month, expenses is the operating expenses, Family Size is the total net assets of funds in the same family at the beginning of the month. AggrGr, Growth, Gr & Inc, and Sector are dummies for style. Standard errors are clustered by advisors, time dummies are included but not reported, t-stats are reported in brackets and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | Reported Return | CAPM alpha | Fama-French alpha | Carhart alpha |
|---|---|---|---|---|
| Outsourced | -9.26* | -10.60** | -9.82*** | -7.80** |
| | [-1.90] | [-2.50] | [-3.07] | [-2.58] |
| ln(Fund Size) | 5.04*** | 5.38*** | 5.22*** | 3.52*** |
| | [4.30] | [5.25] | [6.02] | [4.31] |
| Expenses | -2.65 | -8.86*** | -7.18*** | -7.93*** |
| | [-1.09] | [-3.21] | [-3.12] | [-3.61] |
| Fund Age | -0.05*** | -0.05*** | -0.04*** | -0.04*** |
| | [-4.45] | [-5.79] | [-6.08] | [-5.53] |
| Turnover | -0.58 | 0.58 | 1.25 | 0.54 |
| | [-1.00] | [0.67] | [1.09] | [0.82] |
| ln(Family Size) | 0.23 | -0.4 | -0.08 | -0.19 |
| | [0.18] | [-0.38] | [-0.10] | [-0.23] |
| AggrGr | 39.94*** | 22.69*** | -1.21 | -10.65*** |
| | [7.65] | [4.91] | [-0.32] | [-2.96] |
| Growth | 22.06** | 11.62 | 7.6 | 8.62 |
| | [2.38] | [1.41] | [1.06] | [1.28] |
| Gr & Inc | 2.42 | -17.53*** | -1.15 | -4.14 |
| | [0.54] | [-5.06] | [-0.40] | [-1.44] |
| Sector | 21.16*** | -2.54 | -1.25 | 0.2 |
| | [5.06] | [-0.74] | [-0.44] | [0.07] |
| Constant | 261.19*** | -34.04 | -25.13 | 9.67 |
| | [7.82] | [-1.05] | [-0.79] | [0.31] |
| Adj. $R^2$ | 0.6149 | 0.08268 | 0.06969 | 0.07283 |
| Observations | 48990 | 48807 | 48807 | 48807 |

Table 2.6: **Performance of Outsourced and In-house Funds Managed by Same Advisors for Matched Sample**

This table reports OLS regression results of performance for a matched sample consists of pairs of in-house and outsourced funds managed by same advisors. Each outsourced fund is matched with an in-house fund which is managed by the same advisor, has the same investment style as classified by CRSP, and is closest in total net assets. CAPM alpha, 3-factor alpha, and 4-factor alpha are risk adjusted return using CAPM, Fama-French 3-factor and Carhart's 4-factor model (as described in Table 2.1). Outsourced is a dummy variable equal to 1 if the fund is outsourced. Other control variables are as in Table 2.5. Standard errors are clustered by advisors, time dummies are included but not reported, t-stats are reported in brackets and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | Reported Return | CAPM alpha | Fama-French alpha | Carhart alpha |
|---|---|---|---|---|
| Outsourced | -25.21** | -14.97* | -12.39** | -11.15** |
| | [-2.56] | [-1.84] | [-2.23] | [-2.15] |
| ln(Fund Size) | 6.14* | 8.26*** | 7.45*** | 5.37*** |
| | [1.89] | [3.09] | [3.97] | [3.10] |
| Expenses | -8.07** | -8.07** | -6.77** | -6.98*** |
| | [-2.06] | [-2.37] | [-2.39] | [-2.79] |
| Fund Age | -0.07** | -0.07*** | -0.06*** | -0.05*** |
| | [-2.52] | [-3.33] | [-3.75] | [-3.34] |
| Turnover | -4.38 | 1.88 | 1.24 | -1.88 |
| | [-0.86] | [0.40] | [0.32] | [-0.54] |
| ln(Family Size) | -6.78** | -1.48 | 1.01 | 0.88 |
| | [-2.27] | [-0.62] | [0.56] | [0.51] |
| AggrGr | 27.31 | 30.24** | -10.95 | -19.03** |
| | [1.62] | [2.34] | [-1.23] | [-2.32] |
| Growth | 5.57 | -13.01 | 5.46 | 5.46 |
| | [0.15] | [-0.50] | [0.27] | [0.28] |
| Gr & Inc | -21.78* | -31.04*** | -6.72 | -9.90* |
| | [-1.73] | [-3.61] | [-1.05] | [-1.67] |
| Sector | 2.73 | -10.79 | -7.07 | -2.4 |
| | [0.22] | [-1.31] | [-1.22] | [-0.45] |
| Constant | 363.33*** | -6.7 | -1.8 | 25.08 |
| | [8.19] | [-0.17] | [-0.05] | [0.71] |
| Adj. $R^2$ | 0.6632 | 0.08987 | 0.08552 | 0.08567 |
| Observations | 7208 | 7186 | 7186 | 7186 |

Table 2.7: **Return Gap of Outsourced and In-house Funds Managed by Same Advisors**

This table reports OLS regression results of return gaps for sample of in-house and outsourced funds managed by same advisors and matched sample. Monthly return gaps are as in Table 2.1. Outsourced is a dummy variable equal to 1 if the fund is outsourced. Fund Size is the fund's total net assets at the beginning of the month, expenses is the operating expenses, Family Size is the total net assets of funds in the same family at the beginning of the month. AggrGr, Growth, Gr & Inc, and Sector are dummies for style. Standard errors are clustered by advisors, time dummies are included but not reported, t-stats are reported in brackets and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | Un-matched Sample | Matched Sample |
|---|---|---|
| Outsourced | -7.97*** | -7.27* |
| | [-3.25] | [-1.91] |
| ln(Fund Size) | -1.11* | 3.17** |
| | [-1.80] | [2.16] |
| Expenses | -0.17 | -4.10 |
| | [-0.08] | [-1.61] |
| Fund Age | -0.01 | -0.03*** |
| | [-1.11] | [-2.79] |
| Turnover | 1.44 | 2.82 |
| | [1.14] | [0.66] |
| ln(Family Size) | 0.40 | -1.66 |
| | [0.65] | [-1.55] |
| AggrGr | 8.32*** | 9.40 |
| | [2.79] | [1.41] |
| Growth | 13.22*** | 8.57 |
| | [3.11] | [1.00] |
| Gr & Inc | -1.85 | -6.66 |
| | [-0.73] | [-1.24] |
| Sector | -0.35 | -6.26 |
| | [-0.15] | [-1.37] |
| Constant | 30.89 | 37.68** |
| | [1.46] | [2.09] |
| Adj. $R^2$ | .01314 | .007378 |
| Observations | 40573 | 5818 |

Table 2.8: **IPO Allocation and IPO Contribution to Performance**

This table compares IPOs allocation and contribution of IPOs to performance between outsourced and in-house funds managed by the same advisors. For the stock level, Allocation - All IPO is the allocation of IPO stocks to funds where the allocation is defined as the fraction of IPO stocks in the holding to funds' total net assets. Allocation - Hot IPO is the above measure but take into account only hot IPO stocks, defined as IPO stocks have positve first day returns. At the fund level, Allocation - All IPO is the total Allocation of all IPO stocks that a fund holds at the end of the quarter after their issuance. Allocation - Hot IPO is Allocation but for only hot IPO stocks. Contribution to Perf. - All IPOs is the returns on the first day of IPO stocks times the fraction of those IPO stocks in funds' total net assets. Contribution to Perf. - Hot IPOs is the returns on the first day of hot IPO stocks times the fraction of those IPO stocks in funds' total net assets. Reported t-test statistics are for test of the difference between means of samples and *,**,*** denote significance at 10%, 5%, 1% level, respectively.

| | **In-House** | | **Outsourced** | | |
|---|---|---|---|---|---|
| | Mean | Median | Mean | Median | t-test |
| **Stock Level** | | | | | |
| Allocation - All IPO | 31.49 | 15.05 | 25.59 | 11.69 | 5.97*** |
| Allocation - Hot IPO | 30.70 | 14.73 | 25.02 | 11.53 | 5.63*** |
| **Fund Level** | | | | | |
| Allocation - All IPO | 134.71 | 76.57 | 112.91 | 61.44 | 2.39** |
| Allocation - Hot IPO | 128.60 | 72.48 | 106.35 | 58.00 | 2.55** |
| Contribution to Perf. - All IPO | 36.94 | 9.10 | 35.36 | 8.64 | 0.31 |
| Contribution to Perf. - Hot IPO | 39.28 | 10.02 | 37.29 | 9.38 | 0.38 |

Table 2.9: **Risk Taking in Outsourced and In-house Funds Managed by Same Advisors - Deviation from Style**

This table reports OLS regressions where dependent variables are deviation of systematic risk from fund style's systematic risk (Column 1 and 3), deviation of idiosyncratic risk from style's idiosyncratic risk (Column 2 and 4), and $R^2$ from the annual regression of monthly fund returns on the average of monthly returns of all funds in the same style (Column 5). Deviation of Systematic/Idiosyncratic risk are the log of the absolute differences between fund's Systematic/Idiosyncratic risk and the mean Systematic/Idiosyncratic risk of all other funds in its investment style. Systematic/Idiosyncratic risks the coefficients of market premiums and the sum of residual standard deviation from the annual regression of monthly fund's return in excess of 3-month T-bill rate on monthly market premiums (Column 1 and 2), which are the difference between market returns (proxied by CRSP value-weighted index returns) and 3-month T-bill rates and on the Carhart's 4 factors (Column 3 and 4). Fund Size is the fund's last year total net assets, expenses is the operating expenses, Family Size is the last year total net assets of funds in the same family. AggrGr, Growth, Gr & Inc, Sector are dummies style. Standard errors are clustered by advisors, t-stats are reported in brackets and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | Deviation of Systematic Risk - CAPM | Deviation of Idiosyncratic Risk - CAPM | Deviation of Systematic Risk - 4-factor | Deviation of Idiosyncratic Risk - 4-factor | $R^2 in$ Style Return Regression |
|---|---|---|---|---|---|
| Outsourced | -0.0279** | -0.0007 | -0.0153 | -0.0005 | 0.0173 |
| | [-2.56] | [-1.51] | [-1.47] | [-1.24] | [1.14] |
| Expenses | 1.6872 | 0.0605 | 2.9703*** | 0.016 | -2.0244* |
| | [1.46] | [1.65] | [3.29] | [0.76] | [-1.68] |
| Turnover | 0.0063* | 0.0003 | 0.0053 | 0.0002 | -0.0070*** |
| | [1.84] | [1.04] | [1.38] | [1.43] | [-5.23] |
| Fund Age | 0 | -0.0000*** | 0 | -0.0000** | 0.0001** |
| | [-1.21] | [-3.70] | [0.29] | [-2.44] | [2.53] |
| ln(Fund Size) | 0.0042 | 0.0003** | -0.0077** | 0 | -0.0032 |
| | [1.46] | [2.57] | [-2.46] | [-0.04] | [-1.42] |
| ln(Family Size) | -0.0065** | -0.0002 | -0.0014 | -0.0001 | 0.0105*** |
| | [-2.57] | [-1.63] | [-0.47] | [-0.85] | [4.05] |
| AggrGrowth | 0.1617*** | 0.0067*** | 0.1385*** | 0.0035*** | 0.0001 |
| | [11.19] | [10.12] | [11.44] | [10.61] | [0.01] |
| Growth | 0.0658*** | 0.0057*** | 0.2071*** | 0.0050*** | 0.0450*** |
| | [5.22] | [8.77] | [10.54] | [9.77] | [3.48] |
| GrowthIncome | 0.0637*** | 0.0031*** | 0.0795*** | 0.0022*** | -0.0148 |
| | [8.12] | [8.67] | [11.47] | [8.89] | [-1.45] |
| Sector | 0.0730*** | 0.0049*** | 0.0571*** | 0.0030*** | -0.0351*** |
| | [7.55] | [10.66] | [7.54] | [9.95] | [-3.34] |
| Constant | 0.1301*** | 0.0041*** | 0.1196*** | 0.0040*** | 0.7969*** |
| | [4.04] | [2.92] | [3.58] | [4.01] | [25.62] |
| Adj. $R^2$ | 0.0996 | 0.0564 | 0.106 | 0.054 | 0.0537 |
| Observations | 4072 | 4072 | 4072 | 4072 | 4072 |

Table 2.10: **Risk Taking in Outsourced and In-house Funds Managed by Same Advisors - Fund Specific Risk**

This table reports OLS regressions where dependent variables are measures of risk taking: holdings-base beta (Column 1 and 2) and factor loadings (Column 3-5). Holdings-base beta is the median and weighted-average of betas of stocks in funds holdings at year-ends. Beta of stocks are estimated from regression of monthly stock returns in excess of 3-month T-bill rate on monthly market premiums, which are the difference between CRSP value-weighted index returns and 3-month T-bill rates for the last 36 months. Factor loadings are the coefficients from the regression of monthly fund's return in excess of 3-month T-bill rate on Carhart's 4-factor for the last 36 months. Other control variables are defined as in Table 2.9. Standard errors are clustered by advisors and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | Median Beta Holdings | Mean Beta Holdings | SMB | HML | Momentum |
|---|---|---|---|---|---|
| Outsourced | 0.0193 | 0.0438 | -0.0627*** | 0.0054 | -0.0186 |
| | [0.60] | [1.45] | [-3.04] | [0.13] | [-1.28] |
| Expenses | 5.0833** | 4.1244** | 3.2838 | -6.0905*** | 1.2669 |
| | [2.43] | [2.23] | [1.44] | [-2.98] | [1.30] |
| Turnover | 0.0946*** | 0.0819*** | 0.0023 | -0.0184 | 0.0076 |
| | [4.21] | [4.25] | [0.36] | [-1.25] | [1.19] |
| Fund Age | -0.0001* | -0.0001 | -0.0001** | 0.0001* | 0 |
| | [-1.76] | [-1.55] | [-2.28] | [1.66] | [-1.29] |
| ln(Fund Size) | 0.0193** | 0.0107* | -0.0048 | -0.0191** | 0.0090** |
| | [2.45] | [1.69] | [-0.78] | [-1.98] | [2.03] |
| ln(Family Size) | -0.0092 | 0.0018 | -0.0053 | 0.0026 | 0.0023 |
| | [-1.14] | [0.23] | [-0.88] | [0.31] | [0.61] |
| AggrGrowth | 0.1800*** | 0.2166*** | 0.6227*** | -0.0669* | 0.1164*** |
| | [5.48] | [8.01] | [24.23] | [-1.71] | [6.52] |
| Growth | 0.1810** | 0.1171* | 0.3445*** | -0.073 | -0.0141 |
| | [2.48] | [1.88] | [9.99] | [-1.36] | [-0.72] |
| GrowthIncome | 0.0407** | 0.0867*** | 0.0517*** | -0.1754*** | 0.0470*** |
| | [1.98] | [5.21] | [3.26] | [-7.88] | [3.68] |
| Sector | -0.0088 | 0.0452** | 0.0965*** | 0.0209 | -0.0032 |
| | [-0.42] | [2.15] | [6.78] | [0.83] | [-0.29] |
| Constant | 0.7466*** | 0.6214*** | 0.0407 | 0.2444*** | -0.0849** |
| | [9.35] | [8.20] | [0.64] | [2.62] | [-2.04] |
| Adj. $R^2$ | 0.1195 | 0.1135 | 0.4486 | 0.0530 | 0.0819 |
| Observations | 3285 | 3285 | 4072 | 4072 | 4072 |

Table 2.11: **Clientele for Outsourced and In-house Funds Managed by Same Advisors**

This table reports OLS regressions where dependent variables are measures of clientele characteristics of funds. The independent variables are the sensitivities of monthly flows following positive and negative risk-adjusted monthly returns; the independent variables for the last column is investor attrition, which is the fraction of assets has been withdrawn since a fund reached its maximum size. The sensitivity of flow on positive (negative) return is the coefficient obtained when regressing all the following month fund flows normalized by fund's TNA on all positive (negative) risk-adjusted monthly returns () of the last five years for that fund. Column 1 and 2 report CAPM adjusted monthly returns; Column 3 and 4 report Carhart's 4-factor adjusted monthly returns (as in Table 2.1). The fraction of assets has been withdrawn since a fund reached its maximum size for each fund year is defined as the difference between the fund's largest TNA since its inception adjusted by accumulated returns and the fund's TNA at year-end normalized by the fund's TNA at year-end. Other control variables are defined as in Table 2.9. Standard errors are clustered by advisors and *,**,*** respectively denote significance at 10%, 5%, 1% level.

| | Flow to Pos. Perf CAPM | Flow to Neg. Perf CAPM | Flow to Pos. Perf 4-factor | Flow to Neg. Perf 4-factor | Attrition |
|---|---|---|---|---|---|
| Outsourced | -5.1677* | 1.8699 | 6.1714 | 3.2607* | -0.0186 |
| | [-1.93] | [1.39] | [0.67] | [1.97] | [-0.74] |
| Expenses | 2.0051 | -1.2597 | 7.8772* | -2.6248*** | 0.0090 |
| | [1.44] | [-1.27] | [1.67] | [-3.29] | [0.35] |
| Turnover | 0.026 | 0.0785** | 0.1254 | 0.1337*** | 0.0092 |
| | [0.51] | [2.17] | [0.56] | [3.40] | [1.64] |
| Fund Age | -0.0075* | -0.0006 | 0.0066 | -0.0002 | 0.0003*** |
| | [-1.93] | [-0.44] | [0.62] | [-0.12] | [6.95] |
| ln(Fund Size) | 0.1451 | 0.1688 | 0.9964 | 0.1196 | -0.0369*** |
| | [0.63] | [0.94] | [1.39] | [0.31] | [-6.13] |
| ln(Family Size) | 0.4307 | 0.0862 | 0.3745 | 0.1041 | 0.0040 |
| | [1.44] | [0.61] | [0.60] | [0.51] | [0.65] |
| AggrGrowth | -7.8637* | -2.0545 | 4.7563 | -0.4401 | 0.1221*** |
| | [-1.78] | [-1.31] | [0.37] | [-0.21] | [5.90] |
| Growth | -7.5651* | -0.6783 | 4.0132 | 0.3943 | 0.1767*** |
| | [-1.68] | [-0.45] | [0.32] | [0.29] | [6.58] |
| GrowthIncome | -6.0808 | -1.3662 | 6.3545 | -0.8507 | 0.1261*** |
| | [-1.43] | [-0.95] | [0.50] | [-0.60] | [5.75] |
| Sector | -6.5377 | -0.9563 | 9.6483 | -1.1852 | 0.0683*** |
| | [-1.50] | [-0.59] | [0.68] | [-0.84] | [3.90] |
| Constant | 1.0469 | 1.0488 | -26.4809 | 2.0674 | 0.2694*** |
| | [0.34] | [0.44] | [-1.44] | [0.54] | [3.87] |
| Adj. $R^2$ | 0.006 | 0.002 | -0.0002 | 0.0066 | 0.0953 |
| Observations | 4072 | 4072 | 4072 | 4072 | 4072 |

# Chapter 3

# Portfolio Pumping in the Mutual Fund Industry

Recent theoretical work by Bhattacharyya and Nanda (2006) and Bernhardt and Davies (2008) models the incentives of mutual fund managers to boost short-term performance through strategic trading known as "portfolio pumping".[1] These models predict that fund managers will attempt to drive up the closing prices for some stocks they already hold because investors reward better-performing funds with greater inflows (Ippolito, 1992; Sirri and Tufano, 1998). Carhart, Kaniel, Musto and Reed (2002) – hereafter CKMR – provide quite persuasive yet indirect evidence of portfolio pumping by documenting that 80 percent of equity funds outperform the S&P 500 index on the last trading day of the year, yet only 37 percent do so the following day. They also document that the quarter's best-performing funds have the largest abnormal quarter-end return reversals and that trading volume in stocks held by these best-performing funds begin to spike upwards during the last 30 minutes of the

[1]Portfolio pumping is sometimes referred to as "marking the close", "high closing", "painting the tape" or "leaning for the tape".

trading quarter.

Collins (2004) points out that fund NAV reversals are confounded by many effects and that the SEC has reported no enforcement actions linking portfolio pumping to mutual funds. To illustrate, consider a fund with substantial holdings in stocks A and B. If stock A increases markedly in value on the last day of the quarter and stock B drops substantially in value the following day, the fund will experience a reversal in NAV which is unrelated to portfolio pumping. Return reversals may also occur more often in funds with volatile holdings. It is also possible that issuers repurchase equities more frequently on the last day of the quarter, and the ensuing price pressure might be misconstrued as the result of portfolio pumping. Because NAV reversals are at best a noisy proxy for portfolio pumping, its prevalence, economic magnitude, and determinants are still not fully understood.

In this paper, I develop a measure of portfolio pumping that is less susceptible to confounding turn-of-quarter effects. My portfolio pumping measure allows me to reexamine the empirical findings of CKMR and to take to the data the predictions of the theoretical literature. Specifically, Bernhardt and Davies (2008) predict that mutual funds who engage in portfolio pumping in a given quarter will do so again the following quarter and that stocks that constitute a fund's largest holding will be subject to the most pumping. Their model also suggests that the managers who performed well relative to others have greater opportunities to inflate portfolio values, while the worst-performing managers temporarily depress their portfolio values by selling off stocks, thereby starting the next quarter ahead of others.

I find that the data broadly supports these predictions: my quarterly measure of portfolio pumping is positively related to its lagged value, and the more mutual funds have of a given stock as their top holding, the more likely the stock exhibits price

pressure around quarter-ends. More generally, the level and concentration of mutual fund ownership significantly affects price pressure in individual stocks. Consistent with previous findings by CKMR, fund managers with better relative performance are more likely to engage in portfolio pumping. Contrary to the predictions of Bernhardt and Davies (2008), poorly-performing fund managers do not depress their portfolio values, but engage in portfolio pumping in a manner similar to managers that perform well. This might be due to avoiding dismissal, a motive not modeled in Bernhardt and Davies (2008).

I also document a distinctive increase in portfolio pumping during the period 1998–2001, followed by a sharp decrease afterwards. Such a decrease is consistent with increased ability of market participants to anticipate fund managers' attempts at portfolio pumping (Bhattacharyya and Nanda, 2006). Alternatively, closer attention by regulators and the media as well as increased threat of litigation may prevent fund managers from attempting to distort quarter-end prices altogether. My investigation of these competing hypotheses suggests that media reports of CKMR's findings resulted in activities by investor advocacy groups and the Securities and Exchange Commission (SEC) that most likely explain the sharp reduction in portfolio pumping.

I also test and reject several alternative hypotheses that might explain the documented reduction in portfolio pumping. More generally, I am able to tighten the link between stock return patterns and the likelihood that these patterns result from mutual fund portfolio pumping and show that changes in regulatory attention and scrutiny, unaccompanied by changes in the regulatory or legal framework, markedly affected the behavior of mutual fund managers.

The remainder of this paper is organized as follows: Section 3.1 describes the rationale for, and the construction of, the portfolio pumping measures and lays out

the hypotheses. Section 3.2 describes the data, while Section 3.3 provides the basic regression results and documents how regulatory scrutiny has increased. Section 3.4 investigates competing explanations for the decrease in portfolio pumping activities and Section 3.5 concludes.

## 3.1 Measure Construction and Hypothesis Development

### 3.1.1 Measuring Portfolio Pumping

Virtually all attempts in the literature to identify portfolio pumping of individual mutual funds involve examining daily return reversals of fund net asset values (NAVs) around quarter-ends (Zweig, 1997; McFarland, Howlett, and Walton, 2000; CKMR, 2002; Hulbert, 2004; Gallagher, Gardner, and Swan, 2008). This approach is also a starting point for investigations by the Securities and Exchange Commission (SEC). Lori Richards, the SEC's director of the Office of Compliance Inspections and Examinations states: "We are looking for funds that have changes in net asset values (NAV) at the end of a quarterly reporting season that would indicate portfolio pumping."[2] Collins (2004), however, argues that changes in NAVs around quarter-end could be driven by effects unrelated to portfolio pumping: The stock holdings that cause the NAV to increase may not be the stock holdings responsible for the NAV reversal on the following day, funds invested in more volatile stocks are likely to exhibit NAV reversals more often than funds invested in less volatile stocks, and news-related stock price movements or repurchases may be more likely to occur on the last day of the

[2]John Labate and Elizabeth Wine: "SEC probes mutual funds", 30 November 2000, *Financial Times*.

quarter. The measures constructed in the next section directly address concerns that arise from using NAV reversals to infer portfolio pumping.

### Portfolio Pumping Measure

Our portfolio pumping measure is constructed as follows: For each quarter $q$ and fund $f$, I obtain the most recent quarterly holdings from Thomson Financial. For each stock $j$ in the fund's holdings, I use transaction prices from the New York Stock Exchange Trade and Quote (TAQ) database to calculate each stock's returns for the last 30 minutes of each trading day.[3] To classify a given stock as pumped, I require that it beats the S&P 500 during the last 30 minutes of day $t$ and underperform the S&P 500 on day *t+1*.[4]

Formally, let $\text{ExR30}_{j,t}$ be the 30-minute return for stock $j$ on day $t$ in excess of the S&P 500 Index, calculated for the time period 3:30–4:00 p.m. Similarly, let $\text{ExR}_{j,t+1}$ be the next-day's return in excess of the S&P 500 Index. For each stock $j$ and day $t$, then define:

[3]More specifically, for all stocks held by mutual funds at quarter-ends, I acquire the Actual Trade Prices closest to the 30 minutes before the closing mark and the closing price. This time period is 3:30–4:00 p.m. for all quarters with the exception of Dec. 31, 1999. That day, the market closed early and hence I use 12:30–1:00 p.m. I exclude non-quarter-end days if the market closed prior to 4:00 p.m.

[4]As a robustness check, I also require a more restrictive classification of runup and reversal: Specifically, for the 30-minute return on day $t$, the stock needs to exhibit a positive return in excess of the S&P 500 if the S&P 500 increases in value during the last 30 minutes of the trading day. On days where the S&P 500 return is negative during the last 30 minutes of the trading day, the stock needs to exhibit a positive 30-minute stock return. In addition, for the return on day *t+1*, I require that the stock exhibits a return more negative than the S&P 500 if the S&P 500 decreases in value; I require the stock to exhibit a negative return if the S&P 500 increases. I obtain very similar results with this classification.

$$\text{Ret30}^*_{j,t} = \begin{cases} \text{ExR30}_{j,t} \text{ if ExR30}_{j,t} > 0 \text{ \& ExR}_{j,t+1} < 0 \\ 0 \text{ otherwise} \end{cases} \tag{3.1}$$

For each mutual fund $f$ and quarter-end $q$, I want to measure how much of a fund's quarterly performance can be attributed to stocks that are most likely pumped, that is, stocks that outperform the S&P 500 index during the last 30 minutes preceding the quarter-end and underperform the index the following day. I therefore calculate a simple value-weighted average of all stocks exhibiting positive excess returns during the last 30 minutes of the last trading day of the quarter $T$ and negative excess returns the following day: $\sum_{j=1}^{n} w^f_{j,q}\text{Ret30}^*_{j,t=T}$. Yet, an important concern is that some stocks will exhibit this transitory return pattern by chance alone, and that funds invested in more volatile stocks will more likely hold stocks that exhibit this pattern at quarter-end, even if their fund managers do not engage in portfolio pumping. To address this concern, I subtract the daily time-series average from the end-of-quarter value, where the average is calculated over all days of the quarter $q$, except the last day ($t$=$T$). My measure is therefore defined as:

$$\text{Portfolio Pumping Measure}^f_q = \sum_{j=1}^{n} w^f_{j,q}\text{Ret30}^*_{j,t=T} - \frac{1}{T-1}\sum_{t=1}^{T-1}\left(\sum_{j=1}^{n} w^f_{j,q}\text{Ret30}^*_{j,t}\right) \tag{3.2}$$

While the exact timing of trades designed to increase portfolio values is unobservable without access to audit trail data, I know from SEC enforcement actions

that fund managers have to trade off the likelihood of order execution with obtaining maximum price impact on the closing price if the order is executed: Buying stocks too early allows the price impact to decay; putting orders in too late jeopardizes order execution, resulting in zero price impact. For several reasons, I only consider effects that occur during the last 30 minutes of the quarter: First, I want to minimize the risk of misattributing news-related stock price movements that occur during the last day of the quarter to portfolio pumping. Second, the SEC's Rule 10b-18, which provides issuers with a "safe harbor" from liability for manipulation when they repurchase their common stock, excludes purchases during the last half hour of trading from its safe harbor.[5] By focusing on the last 30 minutes of trading, I avoid erroneously classifying repurchase-related price pressure to portfolio pumping. Third, CKMR document evidence that at the end of the quarter a large fraction of intraday trading happens during the last half hour. Finally, examples made public through SEC enforcement actions also suggest that trades designed to increase the closing price occur only a few minutes prior to closing.[6]

The economic interpretation of this portfolio pumping measure is straightforward: It measures the performance contribution from stocks which outperform the S&P 500 index during the last 30 minutes preceding the quarter-end and underperform it the following day. Measuring portfolio pumping this way has several advantages relative to analyzing daily changes in fund net asset values (NAVs). First, it excludes the effects of stock price movements that are less likely to be associated with portfolio

[5] See Rule 10b-18 at www.sec.gov/rules/final/33-8335.htm

[6] "For instance, on December 31, 2003, the last trading day of the fourth quarter of 2003, Schultz Investment successfully [...] placed a market buy order for 80,750 shares of BIF at 3:57 p.m. EST, which constituted 76.18% of the day's trading volume in BIF. The share price before the order was $5.90 and BIF closed at $6.30 that day. Similarly, Schultz placed a market buy order for 48,775 shares in JHFT at 3:50 p.m. EST, which constituted 57.84% of that day's trading volume in JHFT. The share price before the order was $16.59, and JHFT closed at $18.40 that day." See www.sec.gov/litigation/admin/33–8650.pdf, p.3

pumping: Stock price movements between market opening and 3:30 p.m., negative 30-minute stock returns, returns of stocks with positive 30-minute returns yet non-negative returns the following day, repurchase-related returns, and returns due to overall market movements. Second, the measure can be constructed for a larger number of mutual funds, since it is based on holdings data available through mandatory SEC filings. In contrast, databases that provide historical data on fund NAVs tend to suffer from survivorship bias. Third, it controls for the fact that funds invested in more volatile stocks will more likely exhibit NAV reversals.

It should be noted that, in order to tighten the link between stock return patterns around quarter-ends and mutual fund portfolio pumping, I systematically underreport the economic impact of portfolio pumping: The effects of driving up stock prices prior to 3:30 p.m. and the effects of pumped stock that do not experience return reversals within one trading day will go undetected. Furthermore, Bernhardt and Davies (2005) find that portfolio pumping by fund managers appears to impact returns on aggregate market indices, so that measuring portfolio pumping relative to the S&P 500 index further understates the economic effect.

**A more restrictive Pumping Measure**

While the measure developed in the previous section can deliver stronger suggestive evidence of portfolio pumping than can an analysis based on changes in fund NAVs alone, it cannot conclusively prove that a certain fund engages in portfolio pumping. Such proof would require fund-level transaction data and strong evidence of managers' intent to manipulate stock prices. While I do not have access to this type of audit-trail data, I can further reduce the likelihood that the last-minute price increases and subsequent return reversals of stocks held by mutual funds are caused by factors

other than portfolio pumping. First, mutual fund managers have an incentive to mark up the prices of stocks in which they hold substantial positions. Second, due to tournament-style performance evaluation, managers should avoid marking up stocks which constitute a substantial part of their competitors' portfolios.[7] Hence, for my more restrictive portfolio pumping measure I add the additional requirements that a stock $j$ comprises at least three percent of a fund's total holdings and that this fund holds at least 2% more of stock $j$ than any other fund in the same investment style $s$:

$$\text{Ret30}^{R}_{j,t} = \begin{cases} \text{ExR30}_{j,t} \text{ if } \text{ExR30}_{j,t} > 0 \ \& \ \text{ExR}_{j,t+1} < 0 \ \& \\ \qquad w^{f}_{j,t} \geq 3\% \ \& \ w^{f}_{j,t} - 2\% \ \geq w^{s}_{j,t} \forall s \neq f \\ 0 \text{ otherwise} \end{cases} \tag{3.3}$$

Analogous to the previous portfolio pumping measure, I calculate a simple value-weighted average of all stocks exhibiting positive returns during the last 30 minutes of the quarter and negative returns the following day. In addition, these stocks need to account for a substantial portion of the fund's holdings, and the fund has to be the largest investor among all mutual funds with the same investment style. As before I control for portfolio-specific volatility by subtracting the daily time-series average from the end-of-quarter value:

[7] Studies that document mutual fund tournaments include Brown, Harlow, and Starks (1996); Chevalier and Ellison (1997); Busse (2001); Basak, Pavlova and Shapiro (2007); Kempf and Ruenzi (2008).

$$\text{Restrictive Pumping Measure}_q^f = \sum_{j=1}^{n} w_{j,q}^f \text{Ret30}_{j,t=T}^R - \frac{1}{T-1}\sum_{t=1}^{T-1}\left(\sum_{j=1}^{n} w_{j,q}^f \text{Ret30}_{j,t}^R\right) \tag{3.4}$$

This restrictive pumping measure only considers stocks where the stock price pattern surrounding quarter-ends can be tied with very high probability to one specific mutual fund. It therefore directly addresses the concern that changes in fund NAVs around quarter-ends could be driven by effects unrelated to portfolio pumping. The restrictive measure is smaller in magnitude in comparison with my base measure because it only includes stocks with the highest propensity of being pumped whereas the base pumping measure takes into account all stocks with price pattern of being pumped. Since weights are always based on the fraction of total assets in stocks, the more stocks included in the measure, the higher the magnitude of the measure. Thus, this restrictive measure underestimates the economic magnitude of portfolio pumping even more than my base measure.

**Return Reversal**

In order to compare my results to previous findings, I also examine daily return reversals of fund NAVs around quarter-ends. I follow Bernhardt and Davies (2005) and measure return reversal for fund $f$ at quarter-end $q$ as the difference between the quarter-end return, $r_t^f$, and the return the following trading day, $r_{t+1}^f$, divided by 2:

$$\text{Return Reversal}_q^f = \frac{r_t^f - r_{t+1}^f}{2} \tag{3.5}$$

For example, if a fund's NAV increased by 65 basis points at quarter end and dropped by 55 basis points the following day, the return reversal measure will yield 60 basis points. As pointed out earlier, by attributing the entire price movement on day $t$ and $t+1$ to portfolio pumping, this measure may provide an upper bound of the economic effect. In contrast, the two measures developed earlier are much more conservative and underestimate the economic effect of portfolio pumping.

### 3.1.2 Hypothesis Development

#### Portfolio Pumping and Past Performance

A well-developed literature on mutual fund tournaments examines how the economic incentives derived from relative positions within peer groups affect the risk-taking behavior of mutual fund managers (see, among others, Brown, Harlow, and Starks, 1996; Chevalier and Ellison, 1997; Busse, 2001; Basak, Pavlova and Shapiro, 2004; Kempf and Ruenzi, 2008). Bhattacharyya and Nanda (2006) and Bernhardt and Davies (2008) specifically model the incentives of mutual fund managers that lead them to (attempt to) influence the closing prices of their stock holdings by executing purchase or sale market orders at or near market close at the end of the quarter.

Bernhardt and Davies (2008) develop a partial equilibrium model of an informed and risk-neutral mutual fund manager with an endogenous budget constraint. Their model predicts that managers who performed well relative to others have greater opportunities to inflate portfolio values. Correspondingly, the "leaning-for-the-tape" hypothesis of CKMR argues that fund managers with the best performance pump their portfolios in order to receive a bigger bonus and to benefit from the convex flow-performance relation (Ippolito, 1992; Sirri and Tufano, 1998). In addition, their

"benchmark-beating" hypothesis predicts that mutual fund managers with median past performance mark up to receive bonuses, which often requires above-median relative performance or beating a passive benchmark index such as the S&P 500.

While the best-performing managers and those close to their benchmark have clear incentives to trade in the direction of their existing holdings, poorly-performing fund managers face a more ambiguous situation: On the one hand, Bernhardt and Davies (2008) predict that the worst-performing managers temporarily depress their portfolio values by selling off stocks, thereby starting the next quarter ahead of others. On the other hand, these fund managers may pump their portfolios to avoid losing their job. Such behavior would be consistent with the results of Brown, Harlow, and Starks (1996) who document that underperforming fund managers increase their portfolio risk. I dub this possibility the "clutching-at-straws" hypothesis.

CKMR find evidence consistent with "leaning-for-the-tape", whereas support for "benchmark-beating" is mixed. On the one hand, articles in the popular press report many incidents of suspicious "benchmark-beating" for mutual funds in the United States (Zweig, 1997; Hulbert, 2004) and Canada (McFarland, Howlett, and Walton, 2000), and hedge funds that are beating or close to beating their benchmarks as of November-end exhibit December returns significantly higher than their average returns from January to November (Agarwal, Daniel, and Naik, 2007). On the other hand, CKMR find no evidence that mutual funds engage in portfolio pumping to beat their benchmark. To my knowledge, the Bernhardt and Davies (2008) hypothesis of poorly-performing managers depressing their portfolio values and the "clutching-at-straws" hypothesis have not been investigated.

### Portfolio Pumping through Time

I investigate three hypotheses regarding the aggregate time-series pattern of portfolio pumping. First, Bernhardt and Davies (2005) argue that the magnitude of portfolio pumping is driven by the growing presence of mutual funds in the market. Using data from 1970 until the third quarter of 2001, they find that the aggregate share of all equity held by mutual funds predicts the size of return reversals around quarter-ends in the CRSP equally-weighted index. If this pattern continues to hold, I should expect portfolio pumping to intensify over time since the share of all equity held by mutual funds increases throughout my sample period. On the level of individual mutual funds, the model of Bernhardt and Davies (2008) predicts that mutual funds who engage in portfolio pumping in a given quarter will do so again in the following quarter.

Second, Bhattacharyya and Nanda (2006) develop a model where an informed and risk-neutral mutual fund manager trades a risky and a riskless asset and engages in portfolio pumping even if the trading is not expected to generate a price impact in equilibrium. The model suggests that strategic traders such as hedge funds attempt to predict mutual fund trading behavior based on publicly available holdings information and trade against funds attempting to drive up quarter-end stock prices. Hence, this model is consistent with the notion that the observed price impact of mutual fund managers' attempts to affect stock prices decays over time as other market participants become more sophisticated in trading against mutual funds. Note that this is true even as fund managers continue to trade with the intention of driving up stock prices.

Finally, since portfolio pumping is illegal, increased attention by regulators and the media may significantly reduce the magnitude of mutual funds pumping activi-

ties. Such a reduction would be analogous to the reaction of Nasdaq market makers in response to Christie and Schultz (1994): Their study provides strong circumstantial evidence that market makers of active Nasdaq stocks implicitly colluded to maintain spreads of a least $0.25 by avoiding odd-eighth quotes. Once several national newspapers had reported their findings and the Justice Department had confirmed that it was launching an investigation into possible antitrust violations, Nasdaq dealers sharply increased their use of odd-eighth quotes (Christie, Harris, and Schultz, 1994; Christie and Schultz, 1995). I investigate which of these three hypotheses regarding the time-series dynamics of portfolio pumping bears out empirically.

## 3.2 Data

Our data are provided by multiple sources. Fund characteristics data are obtained from the CRSP Mutual Fund Database (CRSP MF), fund holdings information from Thomson Financial, and index funds are identified using annual Morningstar Principia discs. I use Mutual Funds Links (MFLINKS) from the Wharton Research Data Services to link the CRSP Mutual Fund Database with Thomson's holdings. Stock prices are extracted from the Trade and Quote (TAQ) and the CRSP databases, and daily fund net asset values (NAVs) from the CRSP mutual fund database and Datastream. Federal Reserve US Flow of Funds accounts provide the dollar value of domestic equity and the dollar value of domestic equity held by mutual funds. The Chicago Board Options Exchange (CBOE) Volatility Index (VIX) is obtained from the CBOE's website.

To avoid cross-sectional dependence arising from regression analysis on the fund share-class level, I aggregate all observations to the fund level by using CRSP portfolio

identifiers.[8] Fund total net assets are calculated as the sum of share-class level total net assets; expense and turnover ratios are the value-weighted averages of the respective share class level variables. I restrict my analysis to domestic equity funds since holdings information is often incomplete for other investment styles. I also exclude index funds, sector funds, funds with total net assets below $5 million and funds that invest less than 50% of their assets in stocks.[9] Every fund in my sample is classified as either Aggressive Growth, Growth, Growth and Income, or Small Stocks. Funds are sorted each quarter into performance quintiles based on their relative performance over the previous eleven months.[10] The remaining variables are defined in Table 3.1.

Panel A of Table 3.2 reports fund characteristics for my sample, which consists of 64,952 fund-quarter observations. The average fund is about 12 years old, charges annualized expenses of 1.32% ($4 \times 33$ basis points), has an annualized turnover rate of 95% ($4 \times 23.74$ basis points), and quarterly return reversals of 53 basis points. My conservative pumping measure suggests that the average fund reports quarterly performance that is 3.57 basis points too high due to portfolio pumping. Panel B of Table 3.2 documents summary statistics for quarterly time series of Market Premium, Sentiment Index, Percentage Equity held in Mutual Funds, and CBOE Volatility Index. Table 3.3 shows the Spearman rank correlations between my two portfolio pumping measures and the return reversal measure described in Section 3.1.1, the Market Premium, the Sentiment Index, the Percentage of Equity Held in Mutual Funds, and the CBOE Volatility Index (VIX). As expected, the first three measures

[8]The CRSP portfolio identifiers are available from 2003 onwards. For funds that exit the database prior to 2003, I rely on fund names to aggregate share classes to the fund level.

[9]For 90% of the fund-quarter observations, the fraction of total net assets invested in equity exceeds 80%.

[10]Performance is measured relative to all other funds with the same investment objective. I do not include the last month of the current quarter since this would, by construction, confound with quarter-end portfolio pumping. The cumulative past performance for the year-end (4th quarter), for example, is calculated from January through November.

are positively correlated with each other. All three measures are negatively correlated with the market premium, suggesting that portfolio pumping is more pronounced at quarter-ends following down-markets.

## 3.3 Results

### 3.3.1 Evidence from fund-level regressions

I now investigate whether the magnitude of portfolio pumping has changed over time and how managers' propensity to engage in pumping relates to their past performance. I start by plotting the data. Panel A of Figure 3.5 shows box plots by year for our measure of portfolio pumping from Equation 3.2. The measure suggests that portfolio pumping was particularly prevalent during 1998 through 2000. Pumping activity reduced in 2001 and 2002, and the magnitude of pumping from 2003 on is much lower. The dispersion of the measure has also reduced drastically. In sum, price impact of portfolio pumping activity appears to have peaked in 2000 and reduced in recent years.

Figure 3.5 shows two-dimensional scatter plots for each fund investment style and for three different time periods. The vertical axis displays the values of the portfolio pumping measure constructed in Equation 3.2. The horizontal axis shows the relative (percentage) ranking over the previous eleven months within each investment style. The much higher values during the 1998–2001 period reiterate the pattern shown in Figure 3.5. But in addition, the plots show that portfolio pumping is not just concentrated among the best-performing funds. Furthermore I observe "across-the-board" increases in pumping activities for all investment styles and at all levels of style-adjusted past performance. Especially during the 1998–2001 period, growth

funds as well as growth and income funds exhibit a "U-shaped" relation between their relative past performance ranking and the magnitude of portfolio pumping.

To analyze my graphical findings formally, I employ multivariate regressions.[11] In Panel A of Table 3.4, I regress the three different measures of portfolio pumping from Section 3.1.1 on an indicator that equals one after 2001 (Post 2001) and zero otherwise. To investigate whether mutual fund managers are "leaning for the tape", "attempting to beat their benchmark", or "clutching at straws", I sort each fund into quintiles based on their past performance, which is measured over the previous eleven months relative to all other funds within the same investment style. Past Performance Q1 is an indicator variable equal to one if the fund's relative past performance is in the bottom 20% and zero otherwise. Past Performance Q2 equals to one if the fund's relative past performance is in the penultimate quintile and zero otherwise. Past Performance Q3 through Q5 are defined analogously, where Q5 denotes the quintile of best-performing funds. Control variables include the natural logarithm of fund size, quarterly fund expense and turnover ratios, fund age, and indicator variables denoting the fourth quarter (year-end) and the fund's investment style.

The negative coefficient on the Post 2001 indicator variable shows that portfolio pumping activity has been significantly reduced from 2002 onwards. Average return reversals reduced by 43 basis points per quarter, and portfolio pumping, as measured by my more conservative pumping measure, reduced by 9 basis points per quarter. Even my most restrictive alternative measure indicates a statistically significant reduction in pumping activity.

The positive and significant coefficients on the indicator variables denoting the best- and worst-performing funds show that managers who performed particularly

[11]Following Petersen (2008), all regressions display White standard errors clustered by funds.

well or particularly poorly engage in more portfolio pumping than managers with median performance. The finding that better-performing managers mark up stocks more than managers in the middle performance quintile is consistent with that of CKMR (2002), who find evidence for the "leaning-for-the-tape" hypothesis, but not for the "benchmark-beating" hypothesis.[12]

In addition to confirming these previous findings using a larger sample and a more refined measure of portfolio pumping, I also provide evidence for the "clutching-at-straws" hypothesis: Portfolio managers in the bottom performance quintile, who face the highest threat of dismissal (Khorana, 1996; 2001), also engage in portfolio pumping. The economic magnitude of their activity is slightly lower when compared to that of the top performance quintile: The worst-performing funds exhibit 2.8 basis points more return reversal and about one-half basis point more portfolio pumping per quarter than funds in the median performance quintile. This result does not support the prediction of Bernhardt and Davies (2008) that poorly-performing funds depress portfolio values in order to start the next quarter ahead of their competitors. The best-performing funds show 9.2 basis points more return reversal and 2.0 basis points more portfolio pumping per quarter than median-performing funds. My more restrictive measure produces consistent results.

The style indicator variables show that, relative to growth and income funds, small-stock funds and aggressive-growth funds exhibit 32.4 and 13.0 basis points more return reversal, and 8.1 and 4.0 basis points more portfolio pumping, respectively. Other control variables are statistically significant as well, although their economic effects are small: A one-standard deviation increase in quarterly fund turnover or

[12]In contrast, Agarwal,Daniel, and Naik (2007) provide suggestive evidence that some hedge fund managers do in fact engage in "benchmark-beating" behavior. Specifically, hedge funds that are in-the-money as of November-end exhibit December returns significantly higher than their average returns from January to November.

expenses is associated with an increase in quarterly portfolio pumping of about half a basis point.

The model of Bernhardt and Davies (2008) suggests that mutual funds engaging in portfolio pumping continue to do so in subsequent quarters. I thus include a lagged portfolio pumping measure in my regression specification. Consistent with their prediction, the coefficient of the lagged portfolio pumping measure is positive and significant.[13]

In Panel B of Table 3.4, I display interaction terms of the past fund performance indicators with the Post 2001 indicators. These interaction terms reveal that from 2002 onwards, funds in the best-performing quintile exhibit greater absolute reduction in portfolio pumping and in return reversal when compared to funds in the worst-performing quintile.

CKMR (2002) report that the magnitude of annualized price inflation is over 200 basis points for small-cap funds. Panel A of Table 3.4 shows that annualized return reversal for small stock funds in the best-performing quintile prior to 2002 is 178 basis points (obtained by summing the coefficients of Constant, Small, and Past Perf. Q5 and multiplying by four), which is very much in line with their results. My conservative portfolio pumping measure indicates 69 basis points of annualized price inflation for this group.

To gauge the economic magnitude of portfolio pumping, I construct a daily measure of portfolio pumping, which is the value-weighted average of $\text{Ret30}^*_{j,t}$ in Equation 3.1 across all stocks $j$ held by a given fund $f$:

[13] In unreported robustness checks I repeat this specification with three lags and obtain qualitatively similar results.

$$\text{Daily Pumping Measure}_t^f = \sum_{j=1}^{n} w_{j,q}^f \text{Ret30}_{j,t}^* \tag{3.6}$$

I regress this daily measure on a quarter-end dummy, a dummy equal to one on month-ends other than the quarter-end, and control variables that include quarter-fixed-effects, the natural logarithm of the fund's size, and the natural logarithm of the fund family size. The results are displayed in Table 3.5 (the control variables are omitted for brevity). Panel A shows that from 1993 to 2001, the average mutual fund increased its quarterly performance by about 9.6 basis points through portfolio pumping. The average small-cap fund reported 21 basis points higher performance during this time period. Since the 2001 total net asset value (TNA) of all funds in my sample exceeds 2.3 trillion dollars, I estimate that quarterly mutual fund portfolios in that year are artificially inflated by about 2.2 billion dollars. Panel B of Table 3.5 documents that, for the 2002 through 2006 period, the quarter-end value of the daily pumping measure no longer exceeds its average value for the remaining non-month-end days of the quarter: The quarter-end dummy is only positive and significant for small-cap funds, but even for this investment style, the magnitude reduced from 21 basis points to less than 2 basis points. The results for the entire sample period in Panel C show that this reduction is not driven by lower daily portfolio volatility in the latter period: The Post 2001 dummy variable equals one for every day in 2002 through 2006 and the coefficients indicate that the daily pumping measure is not much different throughout the two periods of the sample. In contrast, the interaction term between the Post 2001 dummy and the quarter-end dummy clearly shows the significant reduction in portfolio pumping across all four style categories.

To summarize, I provide evidence that portfolio pumping has sharply decreased from 2002 onwards and that managers in both the top and bottom performance quintile mark up stocks more aggressively than managers in the median performance quintile.

### 3.3.2 Evidence from stock-level regressions

The previous section measured portfolio pumping by mutual funds as the value-weighted return of stocks in their holdings that appreciate during the last 30 minutes of the quarter and experience price reversal the following day. In this section, I analyze which stocks are most likely to exhibit this return pattern around quarter-ends and investigate whether the level and concentration of mutual fund ownership has marginal explanatory power, as predicted by the theoretical model of Bernhardt and Davies (2008). I also examine whether the magnitude and likelihood of occurrence of these temporary price increases of individual stocks at quarter-ends have diminished after 2001.

Specifically, for every stock $j$ with TAQ transaction data available at quarter-end $t$, I calculate $\text{Ret30}^*_{j,t}$ as described by Equation 3.1. This measure is the dependent variable for my Tobit model in Panel A of Table 3.6. Panel B presents a Probit model with the dependent variable set equal to one if $\text{Ret30}^*_{j,t}$ is strictly positive. Due to the tournament-style industry structure (Brown, Harlow, and Starks, 1996), I expect a non-linear relation between the fraction of shares owned by mutual funds and $\text{Ret30}^*_{j,t}$: Up to a point, a greater fraction of shares owned by mutual funds increases the likelihood that a given stock will be subject to quarter-end portfolio pumping. The larger this fraction, though, the greater the likelihood that competitors benefit if a fund manager engages in last-minute trading to drive up the stock price. Hence,

beyond a certain point larger mutual fund holdings are likely to decrease $\text{Ret30}^*_{j,t}$. I also expect larger and more frequent temporary stock price increases if mutual fund ownership of a given stock is more concentrated.

Table 3.6 shows that these predictions bear out empirically: For low levels of mutual fund ownership, Model 1 shows that a one-percent increase in mutual fund holdings is associated with a 1.3-basis point increase in $\text{Ret30}^*_{j,t}$ and a 0.65% higher probability that a stock exhibits a return pattern consistent with portfolio pumping. For stocks with mutual fund ownership levels of 20% and more, these return patterns are relatively smaller in magnitude and less likely to occur. Consistent with the results in the previous section, $\text{Ret30}^*_{j,t}$ is 123 basis points lower after 2001. Put differently, after 2001 it is about 42% less likely that stocks exhibit temporary price increases at quarter-end.

Of course, other factors are likely to affect $\text{Ret30}^*_{j,t}$ as well. I therefore include additional variables to control for liquidity, volatility, and past performance. Liquidity controls include the number of market makers, an indicator variable equal to one if the firm is traded on Nasdaq, and the average daily share volume (excluding the quarter-end and its four surrounding days). Volatility is measured as the standard deviation of daily returns (again, excluding the same five days). I include cumulative returns from the first day until the penultimate day of the quarter-end to control for the possibility that last-minute temporary price increases are driven by either momentum or window dressing.

I find that $\text{Ret30}^*_{j,t}$ is larger for firms trading on Nasdaq, for firms with higher cumulative returns, and increases in firm size for firms that are roughly below the median NYSE size breakpoint. In contrast, $\text{Ret30}^*_{j,t}$ is decreasing in the number of market makers, volatility, and firm size (for firms above the median NYSE size break

point). While these additional variables improve model fit, they do not affect the direction or statistical significance of the mutual fund holdings variables and the Post 2001 indicator.

In Model 2 I replace mutual fund holdings variables with institutional holdings variables and establish that the results are not sensitive to how I measure intermediated ownership. In Model 3, I test the prediction of Bernhardt and Davies (2008) that mutual funds drive up the stock prices of their largest holdings. Specifically, I count the number of funds for which a given stock constitutes the largest holding and include this as a variable (Top Holding Count) in the regression.[14] Consistent with theoretical predictions, stocks that make up the top holding of more mutual funds exhibit higher price pressure during the last 30 minutes of the quarter. Model 3 also examines whether $\text{Ret30}^*_{j,t}$ is larger for stocks with more concentrated mutual fund ownership, as measured by the Herfindahl concentration index.[15] The coefficient on this concentration measure is not significant, however.

I also examine if stocks used in my restrictive measure have higher probability of being pumped and have a larger 30-minute returns. Thus, I include an indicator variable equal to 1 if a stock, in addition to having $\text{Ret30}^*_{j,t}$ strictly positive, comprises at least three percent of a fund's total holdings and that this fund holds at least 2% more of that stock than any other fund in the same investment style, and zero otherwise. I also include an interaction term between the above described indicator variable and the Post 2001 indicator to separate the different effect of stocks restrictive measure before and after 2001. As shown in Table 3.7, the coefficients on Restrictive

[14] As a robustness check I also measure top holdings by indicating the top 5 and top 10 largest holdings. The results remain unchanged.

[15] For each stock $j$, the Herfindahl index of mutual fund ownership concentration equals $\sum_{i=1}^{n} s_i^2$, where $s_i$ is the fraction of shares held by fund $i$, and $n$ is the number of funds. The Herfindahl index of institutional ownership concentration is constructed analogously.

Stocks are positive and significant in all Tobit and Probit models, indicating that stocks used in my restrictive measure have higher probability of being pumped and have a larger 30-minute returns.

By analyzing stock-level price pressure during the 30 minutes preceding the quarter-end I document three findings: First, the level, and to a lesser extend the concentration, of mutual fund ownership explain temporary stock price increases at the end of the quarter. Second, consistent with previous findings on mutual fund tournaments, the relation between the fraction of shares owned by mutual funds and temporary price increases around the end of the quarter is positive for low levels of mutual fund holdings and negative for higher levels. This result is robust to an alternative specification of ownership. Finally, individual stocks exhibit less end-of-quarter price pressure from 2002 onwards, which mirrors results from the preceding section.

### 3.3.3 What caused the reduction in portfolio pumping?

I reported earlier that my pumping measure indicates significantly lower magnitudes of portfolio pumping for the period from 2002 onwards. One possible explanation for this observation is advanced in Bhattacharyya and Nanda (2006). They develop an equilibrium model where an informed and risk-neutral mutual fund manager trades a risky and a risk-free asset in a batched order market (Kyle, 1985). Their model predicts that fund managers engage in portfolio pumping even if the trading is not expected to generate a price impact in equilibrium. Furthermore, the model addresses the possibility that strategic traders (i.e., market makers, hedge funds, etc.) seek to predict mutual fund trading behavior based on publicly available holdings information and trade against funds attempting to drive up quarter-end stock prices.

An alternate explanation for the reduction in portfolio pumping is that increased

regulatory scrutiny and a greater threat of costly litigation led mutual fund managers to significantly reduce the magnitude of their pumping activities. While these two competing hypotheses are both consistent with the observed reduction in portfolio pumping, they have different predictions with regard to trading volume: If mutual fund managers still execute last-minute market orders yet are less successful because sophisticated investors trade against them, I should observe that abnormal trading volume during the last 30 minutes prior to quarter-end stays at at least at similar levels during the later part of my sample period. In contrast, if mutual fund managers are less inclined to engage in last-minute trading due to increased regulatory attention, I should expect a reduction in abnormal volume from 2002 onwards. I empirically distinguish between these two possible explanations by analyzing normalized volume of individual stocks that were with very high probability subject to portfolio pumping during the earlier part of my sample period.

In order to identify these stocks, I rank all stocks by their frequency of return reversal (i.e., positive excess return during the last 30 minutes of the quarter and negative excess return the following day) during all quarters from 1993 through 2001 and set the indicator variable "Pumped" to one for the top 5 (top 10 in an alternative specification) percent of stocks that exhibit the largest number of return reversals. These stocks are most likely subject to repeated portfolio pumping. For each stock, I calculate normalized quarter-end trading volume by dividing the 30-minute quarter-end volume by the average 30-minute volume measured over all non-month-end days of the same quarter. I then regress normalized 30-minute volume on a dummy variable identifying the stocks subject to quarter-end price pressure (Pumped), a dummy equal to one for all quarters from 2002 onwards (Post2001), an interaction term (Post2001 $\times$ Pumped), and control variables. The coefficient on the interaction term (Post2001 $\times$

Pumped) is negative and statistically significant in both column one and column four of Table 3.8, which is consistent with the regulatory attention hypothesis: Stocks which were most likely subject to portfolio pumping during the earlier part of my sample period exhibit a significant reduction in abnormal volume during the last 30 minutes of trading prior to quarter-end once both the financial media and the Securities and Exchange Commission (SEC) paid closer attention to mutual fund portfolio pumping.

To address the possibility that these results may be driven by self-selection, I also report the results from a two-step Heckman selection model. In the first step, I run a probit regression of Pumped, the dummy variable denoting the stocks most likely pumped prior to 2002, on the control variables shown in Table 3.8 (excluding the time and industry dummies) as well as the fraction of shares outstanding held by mutual funds, its squared value, and the Herfindahl concentration measure of fund holdings. I then calculate the inverse Mills ratio and include it in our second-stage regression, which is displayed in columns two and five. Columns three and six include an additional interaction term between the Pumped indicator and the inverse Mills ratio. The interaction term (Post2001 $\times$ Pumped) maintains its sign and statistical significance in all specifications, suggesting that my results are not driven by self-selection. In summary, the reduction in abnormal last-minute trading volume in stocks that exhibit highly frequent return reversals around quarter-ends prior to 2002 does not support the notion that strategic traders caused the reduction in measured portfolio pumping. My finding is, however, consistent with the regulatory attention hypothesis. The next section briefly outlines how regulatory and media scrutiny increased over time.

### 3.3.4 Increased regulatory scrutiny

This section documents the increase in media attention and regulatory scrutiny of portfolio pumping activities. Anecdotes and newspaper articles alleging portfolio pumping have been around for a decade (Zweig, 1997). The first academic study, however, that provides strong circumstantial evidence of portfolio pumping was CKMR. After the first draft of their paper was circulated in June of 1999, several media outlets reported fund return reversals around the 2000 year-end and linked them to possible portfolio pumping while refering to the findings of CKMR.[16]

The Ontario Securities Commission brought the first legal action alleging portfolio pumping against Royal Bank of Canada's pension fund unit, RT Capital Management Inc., and several stock brokerage firms. John Cleghorn, Chairman of the Royal Bank, publicly apologized as the scandal unfolded. Economic damages to investors are estimated to be 38 million Canadian dollars (Camp, 2000).

Shortly thereafter portfolio pumping received attention from regulators in the U.S. On October 12, 2000, Paul Roye, director of the SEC's Investment Management Division, mentioned that the SEC had established a task force to study portfolio pumping,[17] and on November 27, 2000, the SEC announced that it "has requested trading records from some mutual fund companies as part of a task force investigation into the possibility that funds are engaging in the practice."[18]

In 2001, the SEC pursued enforcement actions in cases where phone or written records helped establish that portfolio managers engaged in last-minute trading with

[16]See, for example, Miriam Hill, "Investors should be weary of last-day fund inflation", January 4, 2000, *Knight Ridder Tribune Business News*.

[17]Phil McCarty, "SEC set to adopt mutual fund name rule by year-end", October 12, 2000, *Dow Jones Newswires*.

[18]Sara Hansard, "SEC probing funds for 'portfolio pumping' : Task force seeks trade records to examine stock purchases", November 27, 2000, *Investment News*.

the intention to drive up prices of stocks already held: On June 1, the SEC filed fraud charges against a hedge fund manager, alleging market manipulation and portfolio pumping;[19] on August 10, it brought charges against ABN AMRO, Oechsle International Advisor and two of their employees who engaged in portfolio pumping.[20]

Overall, portfolio pumping started to receive widespread attention from the financial news media, investor advocacy groups, and regulators from early 2000 onwards. As Panel B of Figure 3.5 shows, this increased attention coincides with a marked decrease in portfolio pumping activities, especially after the SEC pursued several enforcement actions against portfolio managers who engaged in this practice. Table 3.9 shows that the media attention to portfolio pumping was similar in magnitude to the attention the Christie and Schultz (1994) findings of collusion among Nasdaq market makers garnered. It appears that increased regulatory scrutiny offers a plausible explanation for the documented reduction in portfolio pumping. There are, however, other possible explanations which I examine in the next section.

## 3.4 Competing Hypotheses

### 3.4.1 Bull Market in the late 1990s

It is quite apparent that the documented increase and subsequent decrease in portfolio pumping broadly coincides with aggregate equity valuations. It is conceivable that investors are more likely to invest in mutual funds during bull markets, which in turn might increase the competition among fund managers due to the tournament-style organization of the industry (Brown, Harlow, and Starks, 1996). If greater competition

[19] See www.sec.gov/litigation/litreleases/lr17021.htm

[20] SECs 2001 annual report, page 10, at http://edgar.sec.gov/pdf/annrep01/ar01full.pdf

for new money flow results in more pronounced portfolio pumping, then the observed portfolio pumping pattern might be driven by changes in overall market performance. To examine this possibility, I include in my analysis the Market Premium, calculated as the value-weighted CRSP index return minus the risk-free rate. As shown in the first column of Table 3.10, the coefficient on Market Premium is negative and not statistically significant, indicating that portfolio pumping is not more pronounced at the end of quarters with stronger market performance.

Next, I examine whether portfolio pumping is more pronounced in quarters with greater investor sentiment by including the sentiment index developed by Baker and Wurgler (2006), which is an index based on proxies for investor sentiment such as closed-end fund discount, NYSE share turnover, number of IPOs, etc.[21] Column two of Table 3.10 shows that this is indeed the case, but the economic magnitude is fairly small: A one-standard-deviation increase in investor sentiment (0.65) is associated with an increase in the portfolio pumping measure of 1.28 basis points.

Two other effects might possibly drive my results: First, Bernhardt and Davies (2005) suggest that portfolio pumping increases in magnitude as a result of intermediated stock ownership. They document a positive relation between quarterly return reversals in the equally weighted CRSP index and the percentage of corporate equity held by mutual funds. Second, returns during the last 30 minutes of the quarter might be correlated with overall market volatility. To account for these two possibilities, I include the percentage of corporate equity held by mutual funds and the CBOE Volatility Index (VIX) level in my regression analysis.

As Table 3.10 shows, the coefficients on both of these variables are positive and statistically significant, although their economic impact is small: a one-standard devi-

[21] I thank Jeff Wurgler for making the sentiment data available at his personal website http://pages.stern.nyu.edu/ jwurgler/

ation increase in the percentage of corporate equity held by mutual funds is associated with an increase in the portfolio pumping measure of about 1.27 basis points, while the effect for the VIX is about two basis points. While market sentiment, implied volatility, and the level of intermediated stock ownership are all statistically significant and help to improve model fit, controlling for them does not materially decrease the sign, significance, or magnitude of the coefficient on the Post 2001 indicator variable. It is therefore improbable that the rise and fall in portfolio pumping is a mere byproduct of the bull market of the late 1990s.

### 3.4.2 Decimalization

I now consider the possibility that the decrease in portfolio pumping is driven by the conversion of stock quotations from fractional to decimal basis. On June 8, 2000, the Securities and Exchange Commission (SEC) issued an order directing the securities exchanges and the Nasdaq Stock Market to phase out pricing shares in fractions by April 9, 2001.[22] Several studies such as Bessembinder (2003) and Gibson, Singh, and Yerramilli (2003) find that quoted bid-ask spreads decreased after decimalization, which may result in smaller expected gains from portfolio pumping. Moreover, with the expectation of smaller gains, managers may be less inclined to engage in portfolio pumping.

Since the shift from fractional to decimal prices coincides with increased regulatory scrutiny of portfolio pumping, I cannot easily disentangle these two different effects. But if a reduction in bid-ask spreads reduces the propensity of fund managers to engage in portfolio pumping, I should observe such a reduction as well after stocks began trading in sixteenths ($0.0625) instead of eights ($0.125) on June 24, 1997.

[22]See Securities Exchange Act Release No. 42914 (June 8, 2000), 65 FR 38010 (June 19, 2000).

I test this hypothesis by including in our analysis the indicator variable "Sixteenth Spread", which is equal to one from the second quarter of 1997 onwards, when stocks no longer trade in eighths.

As column 4 of Table 3.10 shows, the coefficient for Sixteenth Spread is significantly positive at the one-percent level, while the coefficient on the Post 2001 maintains its negative significance. Since the reduction in spreads from trading in sixteenths does not reduce portfolio pumping, I deem it unlikely that the reduction in spreads from trading in decimals drives the documented reduction in portfolio pumping.

### 3.4.3 Window Dressing

Mutual fund managers may alter the composition of their portfolios around quarterly reporting dates to disclose holdings of stocks that have performed well (Musto, 1997; 1999; O'Neal, 2005). If mutual fund managers engage in this kind of "window dressing", they have an incentive to minimize the transaction costs from building up and subsequently unwinding their cosmetic positions. Trades motivated by window dressing should therefore be executed in ways that minimize price impact and guarantee order execution, whereas trades intended to inflate end-of-quarter holdings attempt to maximize price impact. Trades motivated by window dressing are therefore unlikely to be executed during the last 30 minutes of the quarter and I should not expect these trades to confound my findings.

It is, however, conceivable that some mutual fund managers seek to minimize exposure to stocks they hold for only cosmetic reasons. In that case, they might aggressively buy past winners shortly before the end of the quarter and immediately unwind their positions the next trading day. If mutual funds window dress, our find-

ings may not be evidence of a deliberate attempt to inflate quarter-end holdings, but a mere byproduct of disclosing holdings that are deemed more appealing to investors.

I empirically address this concern by excluding all stocks in the best performance quartile and stocks in the fund's top ten holdings from the construction of my portfolio pumping measure. Results reported in column 6 of Table 3.10 similarly indicate a statistically significant decrease in portfolio pumping after 2001. In conclusion, neither the bull market during the late 1990s, the conversion of stock quotations from fractional to decimal pricing, nor window dressing by mutual funds can adequately explain why portfolio pumping has markedly decreased in recent years.

### 3.4.4 Competition among Market Makers

Table 3.6 shows that, for individual stocks, the number of market makers is negatively associated with price pressure at quarter-end. This finding is consistent with market makers anticipating mutual fund managers' attempts to drive up closing prices and competing for the resulting last-minute order flow (Bhattacharyya and Nanda, 2006): Imagine a stock with a single market maker who receives a large buy order during the last 5 minutes of the quarter from a portfolio manager eager to mark up the close. This is a lucrative opportunity because the trade does not reflect superior information and the portfolio manager is insensitive to costs associated with order execution. With imperfect competition, the price impact of the trade increases as the market maker's profit increases. As more market makers compete for order flow, this price impact is likely to reduce.

While theory and my results in Table 3.6 suggest that competition among market makers counteracts fund managers' ability to engage in portfolio pumping, Christie and Schultz (1994) document that a large number of dealers does not necessarily

thwart anticompetitive behavior. Nevertheless, it might be of concern if our fund-level results stem from stocks with a large number of market makers. I therefore exclude from my portfolio pumping measure all stocks with an above-median number of market makers. As shown in the first column of Table 3.11, this modified measure still indicates a statistically significant decrease in portfolio pumping after 2001.

### 3.4.5 Robustness Check

As further robustness checks, I repeat the regression framework in Panel A of Table 3.4 for a modified measure which does not require stocks to beat the S&P 500 in the first trading days of quarters (Column 2 of Table 3.11) and for a sample of funds in the top quartile and top half in turnover values (Column 3 and 4 of Table 3.11.) In all of these robustness checks, the coefficients for Post 2001 are negative and significant, thus confirming that my findings are robust.

## 3.5 Conclusion

Portfolio pumping, the practice of purchasing stocks already held for the purpose of driving up quarter-end portfolio values, has attracted recent attention from regulators, consumer advocates, and the media, and is the focus of empirical studies (CKMR; Bernhardt and Davies, 2005) as well as theoretical modeling (Bhattacharyya and Nanda, 2006; Bernhardt and Davies, 2008). Disclosing inflated portfolio values at quarter-end benefits mutual fund managers because investors reward better-performing funds with greater inflows (Ippolito, 1992; Sirri and Tufano, 1998), and because managers of such funds receive larger bonuses and face a lower threat of dismissal (Khorana, 1996; 2001). Portfolio pumping is costly though, because the

next-day fund return will be lower as the price impact of the last-minute trades at quarter-end decays. Funds also risk allegations of illegal price manipulation that may result in legal penalties and loss of reputation. I contribute to this emerging literature by first constructing a novel measure that is less susceptible to confounding turn-of-quarter effects (Collins, 2004). This measure allows me to tighten the link between stock return patterns and the likelihood that these patterns result from mutual fund portfolio pumping.

This study is first in taking to the data theoretical predictions by Bhattacharyya and Nanda (2006) and Bernhardt and Davies (2008) about fund manager incentives and portfolio pumping. Specifically, Bernhardt and Davies (2008) predict that mutual funds who engage in portfolio pumping in a given quarter will do so again the following quarter and that stocks that constitute a fund's largest holding will be subject to the most pronounced portfolio pumping. They also suggest that managers who performed well relative to others have greater opportunities to inflate portfolio values, while poor-performing managers temporarily depress their portfolio values by selling off stocks, thereby starting the next quarter ahead of others.

Our quarterly measure of portfolio pumping is indeed positively related to its lagged value, and the more mutual funds have of a given stock as their top holding, the more likely the stock exhibits price pressure around quarter-ends. More generally, the level and concentration of mutual fund ownership significantly affect price pressure in individual stocks. Consistent with previous findings by CKMR, fund managers with better relative performance are more likely to engage in portfolio pumping. Contrary to the predictions of Bernhardt and Davies (2008), however, I find that poorly-performing fund managers, too, engage in portfolio pumping. This might be due to avoiding dismissal, a motive not modeled in Bernhardt and Davies (2008).

I also document a distinctive increase in portfolio pumping during the period 1998–2001, followed by a sharp decrease afterwards. While Bhattacharyya and Nanda (2006) support the notion that mutual fund managers still execute last-minute market orders but are less successful because sophisticated investors trade against them, the regulatory attention hypothesis suggests that mutual fund managers are less inclined to engage in last-minute trading due to increased regulatory scrutiny. By examining normalized 30-minute trading volume of stocks subject to mutual fund pumping, I am able to discriminate between these competing explanations and to provide evidence that media reports of CKMR's findings resulted in activities by investor advocacy groups and the Securities and Exchange Commission (SEC) that most likely explain the sharp reduction in portfolio pumping.

Since the substantial reduction in portfolio pumping could be driven by effects other than increased regulatory vigilance, I investigate three competing hypotheses. However, I do not find evidence that the documented results are caused by the bull market during the late 1990s followed by the bear market of the early 2000s, the conversion of stock quotations from fractional to decimal pricing, or window dressing. I also perform extensive robustness checks to assess the reliability of my measure and the sensitivity of my results to alternative specifications. Overall, I document both the rise and fall in portfolio pumping among U.S. mutual funds and show that increased regulatory attention and scrutiny, unaccompanied by changes in the regulatory or legal framework, markedly affected the behavior of mutual fund managers.

Table 3.1: **Variables List for Chapter 3**

| Variable Name | Description |
|---|---|
| **Pumping Measures** | **(in basis points)** |
| Pumping Measure | Portfolio Pumping Measure defined in Eq. (4) |
| Restr. Pump. Measure | Restrictive Portfolio Pumping Measure defined in Eq. (6) |
| Return Reversal | Return on last trading day of quarter t minus return on first trading day of quarter t+1 divided by 2 - see Eq. (7) |
| Pump. Measure Window Dress | Pumping Measure excluding stocks in top quarterly performance quartile (25%) or in top 10 holdings |
| Pump. Measure Market Maker | Pumping Measure excludes top half of stocks with the most market makers |
| **Fund Characteristics** | |
| ln(Fund Size) | Natural logarithm of fund size in millions |
| ln(Family Size) | Natural logarithm of family size in millions |
| Fund Age | Fund age in months |
| Expenses | Quarterly expense ratio in percentage |
| Turnover | Quarterly portfolio turnover in percentage |
| Aggressive Growth | =1 if fund's style is Aggressive Growth |
| Growth | =1 if fund's style is Growth |
| Growth & Income | =1 if fund's style is Growth & Income |
| Small | =1 if fund's style is Small |
| Past Perf. Q1 (Worst) | Past 11 month Performance Quintile 1 (Worst) |
| Past Perf. Q2 | Past 11 month Performance Quintile 2 |
| Past Perf. Q3 | Past 11 month Performance Quintile 3 |
| Past Perf. Q4 | Past 11 month Performance Quintile 4 |
| Past Perf. Q5 (Best) | Past 11 month Performance Quintile 5 (Best) |
| **Quarterly Series** | |
| Market Premium | Quarterly CRSP Value-Weighted return in excess of risk-free rate in percent |
| Sentiment Index | Constructed from the monthly Baker and Wurgler (2007) Sentiment Index |
| Pctn. Eq. in MF | Aggregate mutual fund holdings of corporate equity divided by total Market Value of domestic companies in percent |
| VIX | CBOE Volatilty Index in percent |
| **Time Dummies** | |
| Year-End | =1 if observation is the last trading day of year |
| Quarter-End | =1 if observation is the last trading day of quarter |
| Post 2001 | =1 if observation is after 2001 |
| Sixteenth Spread | =1 for periods when stocks are quoted in sixteenths ($0.0625) |

Table 3.2: **Fund Characteristics, Pumping Measures and Quarterly Series**

This table provides summary statistics for fund characteristics and portfolio pumping measures. The sample consists of 64,952 fund-quarter observations between 1993 and 2006, except for Sentiment Index, which is only available until the end of 2005. Panel A shows summary statistics for fund characteristics, and Panel B displays summary statistics for the quarterly market premium, the Sentiment Index, the percentage of total equity held by mutual funds, and the CBOE Volatility index (VIX). Fund Size is in $M, Expenses is in percents, Turnover is in percents, Fund Age is in months, and Pumping Measures are in basis points

**Panel A**

| | N | Mean | SD | Q1 | Median | Q3 |
|---|---|---|---|---|---|---|
| Fund Size | 64952 | 1198.88 | 4386.10 | 56.67 | 198.10 | 727.53 |
| Expenses | 64952 | 0.33 | 0.12 | 0.25 | 0.31 | 0.39 |
| Turnover | 64952 | 23.74 | 30.19 | 9.25 | 17.25 | 29.50 |
| Fund Age | 64952 | 150.89 | 165.00 | 51.00 | 93.00 | 167.00 |
| Pumping Measure | 64952 | 3.57 | 16.20 | -4.66 | -0.95 | 6.27 |
| Restr. Pump. M. | 64952 | 0.53 | 5.24 | 0.00 | 0.00 | 0.00 |
| Return Reversal | 56591 | 0.53 | 104.86 | -52.10 | -1.31 | 46.69 |

**Panel B**

| | N | Mean | SD | Q1 | Median | Q3 |
|---|---|---|---|---|---|---|
| Market Premium | 56 | 1.99 | 8.13 | -1.84 | 2.79 | 6.70 |
| Sentiment Index | 52 | 0.28 | 0.65 | -0.13 | 0.28 | 0.54 |
| Pcnt. Eq. in MF | 56 | 19.68 | 5.75 | 15.77 | 20.16 | 22.59 |
| VIX | 56 | 19.20 | 6.96 | 13.14 | 18.97 | 23.53 |

Table 3.3: **Spearman Rank Correlations**

This table reports Spearman Rank Correlations for NAV return reversals, two measures of portfolio pumping, the quarterly market premium, the Sentiment Index, the percentage of total equity held by mutual funds, and the CBOE Volatility index (VIX). P-values are displayed in parentheses.

| Variables | Return Reversal | Pumping Measure | Restr. P. M. | Market Prem. | Sentiment Index | Pcnt. Eq. in MF | VIX |
|---|---|---|---|---|---|---|---|
| Return Reversal | 1.000 | | | | | | |
| Pumping Measure | 0.308 | 1.000 | | | | | |
| | (0.000) | | | | | | |
| Restr. P. M. | 0.064 | 0.392 | 1.000 | | | | |
| | (0.000) | (0.000) | | | | | |
| Market Premium | -0.039 | -0.128 | -0.021 | 1.000 | | | |
| | (0.000) | (0.000) | (0.000) | | | | |
| Sentiment Index | 0.269 | 0.368 | 0.071 | -0.285 | 1.000 | | |
| | (0.000) | (0.000) | (0.000) | (0.000) | | | |
| Pcnt. Eq. in MF | -0.096 | -0.151 | -0.035 | -0.055 | -0.321 | 1.000 | |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | | |
| VIX | -0.009 | 0.207 | 0.043 | -0.399 | 0.225 | -0.164 | 1.000 |
| | (0.030) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | |

Table 3.4: **How Relative Fund Performance Pre/Post 2001 impacts Portfolio Pumping**

This table displays OLS regressions of three different portfolio pumping measures defined in Section 3.1.1. Columns 1 and 4 display regressions of quarterly NAV return reversals, Columns 2 and 5 show regressions for the portfolio pumping measure, and Columns 3 and 6 provide regressions for a stricter measure that ties price pressure in stocks to a unique fund. Independent variables include an indicator variable for all quarters from 2002 onwards (Post 2001), style-adjusted, relative past performance quintiles (Q1 – Q5), and interaction terms between past performance and the Post 2001 indicator. Lagged Pump. Measure is the previous quarter value of the respective pumping measure. All remaining variables are defined in Table 3.1. Robust standard errors are clustered by funds and provided in brackets. Superscripts ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | Panel A | | | Panel B | | |
|---|---|---|---|---|---|---|
| | Return Reversal | Pumping Measure | Restr. Pump. Measure | Return Reversal | Pumping Measure | Restr. Pump. Measure |
| Post 2001 | -43.3443*** | -8.9905*** | -0.6692*** | -40.9409*** | -8.0520*** | -0.5537*** |
| | [0.98] | [0.21] | [0.06] | [1.85] | [0.25] | [0.07] |
| Past Perf. Q1 (Worst) | 2.7847** | 0.5872*** | 0.3203*** | 5.6813*** | 0.8632*** | 0.5088*** |
| | [1.30] | [0.18] | [0.07] | [2.13] | [0.29] | [0.11] |
| Past Perf. Q2 | -1.1465 | 0.0106 | -0.0210 | -0.0891 | 0.1336 | -0.0243 |
| | [1.32] | [0.16] | [0.04] | [2.17] | [0.25] | [0.07] |
| Past Perf. Q4 | 0.9159 | 0.5289*** | -0.0214 | 0.2296 | 0.8182*** | -0.0712 |
| | [1.21] | [0.16] | [0.04] | [1.97] | [0.25] | [0.07] |
| Past Perf. Q5 (Best) | 9.2498*** | 1.9886*** | 0.3043*** | 12.4041*** | 3.2102*** | 0.4382*** |
| | [1.26] | [0.21] | [0.09] | [2.05] | [0.33] | [0.15] |
| Past Perf. Q1 x P2001 | | | | -5.4656** | -0.7067** | -0.4138*** |
| | | | | [2.70] | [0.34] | [0.12] |
| Past Perf. Q2 x P2001 | | | | -2.1740 | -0.3340 | 0.0013 |
| | | | | [2.61] | [0.29] | [0.08] |
| Past Perf. Q4 x P2001 | | | | 1.4818 | -0.7068** | 0.1182 |
| | | | | [2.44] | [0.29] | [0.07] |
| Past Perf. Q5 x P2001 | | | | -6.5088*** | -2.9218*** | -0.3214** |
| | | | | [2.44] | [0.38] | [0.15] |
| Lagged Pump. Measure | 0.0818*** | 0.2544*** | 0.1060*** | 0.0813*** | 0.2530*** | 0.1055*** |
| | [0.01] | [0.01] | [0.03] | [0.01] | [0.01] | [0.03] |
| Year-End | -28.8970*** | -0.4956*** | -0.0630 | -28.9446*** | -0.5157*** | -0.0650 |
| | [1.18] | [0.12] | [0.04] | [1.18] | [0.12] | [0.04] |
| ln(Fund Size) | 0.8934*** | -0.0480 | -0.1317*** | 0.8901*** | -0.0553 | -0.1321*** |
| | [0.29] | [0.05] | [0.02] | [0.29] | [0.05] | [0.02] |
| Expenses | 28.8580*** | 4.1087*** | 1.1424*** | 28.8654*** | 4.1069*** | 1.1416*** |
| | [4.93] | [0.83] | [0.40] | [4.93] | [0.84] | [0.40] |
| Turnover | 0.0599** | 0.0177*** | -0.0018* | 0.0596** | 0.0171*** | -0.0018 |
| | [0.03] | [0.01] | [0.00] | [0.03] | [0.01] | [0.00] |
| Fund Age | -0.0119*** | -0.0018*** | 0.0002 | -0.0118*** | -0.0018*** | 0.0002* |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| Aggressive Growth | 13.0311*** | 3.9724*** | 0.8414*** | 12.9608*** | 3.9534*** | 0.8340*** |
| | [2.59] | [0.52] | [0.21] | [2.59] | [0.52] | [0.21] |
| Growth | -3.9941*** | -0.3896** | 0.0331 | -4.0135*** | -0.4178** | 0.0312 |
| | [1.19] | [0.17] | [0.05] | [1.19] | [0.18] | [0.05] |
| Small | 32.3656*** | 8.0689*** | 0.4160*** | 32.3561*** | 8.0669*** | 0.4129*** |
| | [1.37] | [0.30] | [0.10] | [1.37] | [0.30] | [0.10] |
| Constant | 2.8296 | 7.1068*** | 0.8418*** | 1.6802 | 6.8067*** | 0.7982*** |
| | [2.94] | [0.46] | [0.18] | [3.13] | [0.48] | [0.18] |
| Adj. $R^2$ | 0.0996 | 0.2578 | 0.0241 | 0.0998 | 0.2587 | 0.0244 |
| Observations | 52462 | 61620 | 61620 | 52462 | 61620 | 61620 |

Table 3.5: **Economic Magnitude of Portfolio Pumping**

This table displays OLS regressions of the daily portfolio pumping measure on a quarter-end dummy, a dummy indicating other month-ends, a constant, and controls that include quarter fixed-effects, and the natural logarithms of fund TNA and fund family TNA. These control variables are omitted to preserve space. Columns 1–4 report results for funds with the indicated investment style, while column 5 reports results for all funds. Robust standard errors are clustered by funds and provided in brackets. Superscripts ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

**Panel A: 1993-2001**

| | Aggr. Growth | Growth | Small Cap | GrowthInc. | All |
|---|---|---|---|---|---|
| Quarter-End | 15.8325*** | 5.0489*** | 21.1500*** | 6.0640*** | 9.5798*** |
| | [1.28] | [0.42] | [0.67] | [0.43] | [0.31] |
| Other Month-End | 2.0428*** | 1.7426*** | 2.9148*** | 1.6769*** | 1.9889*** |
| | [0.24] | [0.15] | [0.14] | [0.06] | [0.07] |
| Constant | 7.0649*** | 1.1808 | 5.1842*** | 5.4262*** | 4.1184 |
| | [0.99] | [5.28] | [0.79] | [0.46] | [2.29] |
| Observations | 49881 | 267641 | 149156 | 251379 | 718057 |

**Panel B: 2002-2006**

| | Aggr. Growth | Growth | Small Cap | GrowthInc. | All |
|---|---|---|---|---|---|
| Quarter-End | -1.5870*** | -2.1253*** | 1.8108*** | -1.6794*** | -0.9709*** |
| | [0.24] | [0.06] | [0.14] | [0.07] | [0.06] |
| Other Month-End | 0.8490*** | 0.8124*** | 1.6201*** | 0.5915*** | 0.9366*** |
| | [0.15] | [0.05] | [0.09] | [0.04] | [0.03] |
| Constant | 6.7157*** | 7.2797*** | 7.4203*** | 5.0086*** | 5.8185*** |
| | [0.73] | [0.23] | [0.40] | [0.27] | [0.20] |
| Observations | 34932 | 192097 | 126452 | 180206 | 533687 |

**Panel C: Entire Period**

| | Aggr. Growth | Growth | Small Cap | GrowthInc. | All |
|---|---|---|---|---|---|
| Post 2001 | -1.3068** | 0.3567 | 3.6257*** | -0.5415 | -0.9665*** |
| | [0.43] | [0.61] | [0.38] | [0.28] | [0.22] |
| Post 2001 x Quarter-End | -17.4156*** | -7.3603*** | -19.3289*** | -7.7496*** | -10.6031*** |
| | [1.28] | [0.39] | [0.67] | [0.42] | [0.29] |
| Quarter-End | 15.8308*** | 5.0440*** | 21.1434*** | 6.0639*** | 9.5761*** |
| | [1.28] | [0.42] | [0.67] | [0.43] | [0.32] |
| Other Month-End | 1.5549*** | 1.3613*** | 2.3241*** | 1.2241*** | 1.5415*** |
| | [0.16] | [0.09] | [0.09] | [0.04] | [0.04] |
| Constant | 7.4699*** | 3.4636 | 6.4835*** | 5.5053*** | 5.3921*** |
| | [0.78] | [3.03] | [0.56] | [0.39] | [1.27] |
| Observations | 84813 | 459738 | 275608 | 431585 | 1251744 |

Table 3.6: **Price Pressure in Individual Stocks around Quarter-Ends Pre/Post 2001**

The dependent variable is $\text{Ret30}^*_{j,t}$, the measure of price pressure defined in Eq. (3) for the Tobit model, and an indicator variable equal to one if Ret30* is greater than zero for the Probit model. Fund Hold (Inst. Hold) are the fraction of shares outstanding held by all actively managed mutual funds (all institutions). Fund Hold Sq. and Inst. Hold Sq. are the squared values and the Herfindahl indices measure the concentration of these holdings. No. Market Maker is the number of market makers for Nasdaq stocks and equals one otherwise; NASDAQ denotes Nasdaq stocks and size is the stock's market capitalization. Quarterly Return exclude the quarter-end day. Average Daily Volume and the standard deviation of daily returns (Std. Dev. Daily Ret.) are calculated excluding the 5 days surrounding the quarter-end. Industry dummies and quarter dummies are included in some Models, but coefficients are omitted for brevity. Robust standard errors are clustered by funds and provided in brackets. Superscripts ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | Panel A: Tobit | | | Panel B: Probit | | |
|---|---|---|---|---|---|---|
| COEFFICIENT | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Post2001 | -123.0218*** | -73.0241*** | -118.0390*** | -0.4203*** | -0.3942*** | -0.6214*** |
| | [6.80] | [5.84] | [6.74] | [0.03] | [0.03] | [0.03] |
| Fund Hold | 132.9864*** | | | 0.6487*** | | |
| | [15.04] | | | [0.07] | | |
| Fund Hold Sq. | -339.3687*** | | | -1.3845*** | | |
| | [37.14] | | | [0.17] | | |
| Inst. Hold | | 127.5719*** | | | 0.5457*** | |
| | | [7.82] | | | [0.04] | |
| Inst. Hold Sq. | | -139.4742*** | | | -0.5565*** | |
| | | [9.15] | | | [0.04] | |
| Top Holding Count | | | 0.3109*** | | | 0.0012*** |
| | | | [0.07] | | | [0.00] |
| Fund Herfindahl | | | 83.3398 | | | 0.7172 |
| | | | [87.23] | | | [0.50] |
| No. Market Maker | -0.9116*** | -0.8992*** | -0.9101*** | -0.0040*** | -0.0039*** | -0.0039*** |
| | [0.09] | [0.09] | [0.09] | [0.00] | [0.00] | [0.00] |
| NASDAQ | 54.0150*** | 51.8402*** | 54.2682*** | 0.1655*** | 0.1570*** | 0.1665*** |
| | [2.56] | [2.53] | [2.56] | [0.01] | [0.01] | [0.01] |
| Quarterly Return | 17.7681*** | 17.9159*** | 17.2507*** | 0.1297*** | 0.1297*** | 0.1261*** |
| | [2.31] | [2.30] | [2.30] | [0.01] | [0.01] | [0.01] |
| Avg. Daily Volume | 0.0000** | 0.0000* | 0.0000 | 0.0000 | 0.0000 | -0.0000 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| ln(Size) | 565.0835*** | 556.1159*** | 577.3315*** | 2.3912*** | 2.3581*** | 2.4472*** |
| | [18.24] | [18.12] | [18.32] | [0.05] | [0.05] | [0.05] |
| ln(Size) Sq. | -13.3277*** | -13.1174*** | -13.6201*** | -0.0560*** | -0.0552*** | -0.0572*** |
| | [0.44] | [0.43] | [0.44] | [0.00] | [0.00] | [0.00] |
| Std. Dev. Daily Ret. | -392.5746*** | -367.8899*** | -392.1088*** | -5.6070*** | -5.5040*** | -5.6179*** |
| | [48.02] | [47.86] | [48.02] | [0.20] | [0.20] | [0.20] |
| Constant | -6169.05*** | -6081.73*** | -6294.59*** | -26.17*** | -25.85*** | -26.77*** |
| | [214.13] | [211.95] | [214.80] | [0.59] | [0.58] | [0.58] |
| Industry Dummies | Included | Included | Included | Included | Included | Included |
| Quarter Dummies | Included | Included | Included | Included | Included | Included |
| Wald Test $\chi^2$ | 2804.69 | 2895.43 | 2779.80 | 32825.35 | 32841.18 | 32614.82 |
| Observations | 435668 | 435668 | 435668 | 428852 | 428852 | 428852 |
| Wald Test $\chi^2$ Hold Vars | 85.13 | 266.02 | 22.79 | 89.17 | 252.29 | 21.54 |

Table 3.7: **Price Pressure in Individual Stocks used in Restrictive Measure around Quarter-Ends Pre/Post 2001**

The dependent variable is $\text{Ret30}^*_{j,t}$, the measure of price pressure defined in Eq. (3) for the Tobit model, and an indicator variable equal to one if Ret30* is greater than zero for the Probit model. Restr. Stock is an indicator variable equal to one if a stock comprises at least three percent of a fund's total holdings and that this fund holds at least 2% more of stock than any other fund in the same investment style. Restr. Stock x P2001 is the interaction term between Restr. Stock and Post 2001. Fund Hold (Inst. Hold) are the fraction of shares outstanding held by all actively managed mutual funds (all institutions). Fund Hold Sq. and Inst. Hold Sq. are the squared values and the Herfindahl indices measure the concentration of these holdings. No. Market Maker is the number of market makers for Nasdaq stocks and equals one otherwise; NASDAQ denotes Nasdaq stocks and size is the stock's market capitalization. Quarterly Return exclude the quarter-end day. Average Daily Volume and the standard deviation of daily returns (Std. Dev. Daily Ret.) are calculated excluding the 5 days surrounding the quarter-end. Industry dummies and quarter dummies are included in some Models, but coefficients are omitted for brevity. Robust standard errors are clustered by funds and provided in brackets. Superscripts ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | Panel A: Tobit | | | Panel B: Probit | | |
|---|---|---|---|---|---|---|
| COEFFICIENT | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Restr. Stock | 9.5446*** | 5.4136** | 11.7954*** | 0.0445*** | 0.0284*** | 0.0596*** |
| | [2.14] | [2.15] | [2.12] | [0.01] | [0.01] | [0.01] |
| Post 2001 | -73.8522*** | -113.8836*** | -68.9887*** | -0.4033*** | -0.6062*** | -0.6031*** |
| | [5.87] | [6.64] | [5.81] | [0.03] | [0.03] | [0.03] |
| Restr. Stock x P2001 | -20.5932*** | -16.0968*** | -22.1651*** | -0.0985*** | -0.0798*** | -0.1053*** |
| | [3.18] | [3.19] | [3.19] | [0.02] | [0.02] | [0.02] |
| FundHold | 124.5877*** | | | 0.6130*** | | |
| | [15.03] | | | [0.07] | | |
| FundHoldsq | -322.6936*** | | | -1.3107*** | | |
| | [36.88] | | | [0.17] | | |
| InstHold | | 124.1888*** | | | 0.5282*** | |
| | | [7.88] | | | [0.04] | |
| InstHoldsq | | -135.4970*** | | | -0.5359*** | |
| | | [9.16] | | | [0.04] | |
| NoTopHolding | | | 0.3102*** | | | 0.0012*** |
| | | | [0.07] | | | [0.00] |
| FundHerfindahl | | | 60.3289 | | | 0.6178 |
| | | | [84.90] | | | [0.48] |
| No. Market Maker | -0.9111*** | -0.8980*** | -0.9120*** | -0.0040*** | -0.0039*** | -0.0039*** |
| | [0.09] | [0.09] | [0.09] | [0.00] | [0.00] | [0.00] |
| NASDAQ | 54.0842*** | 51.9289*** | 54.3187*** | 0.1658*** | 0.1575*** | 0.1668*** |
| | [2.57] | [2.54] | [2.56] | [0.01] | [0.01] | [0.01] |
| Quarterly Return | 17.5684*** | 17.8108*** | 17.0635*** | 0.1289*** | 0.1292*** | 0.1252*** |
| | [2.30] | [2.30] | [2.29] | [0.01] | [0.01] | [0.01] |
| Avg. Daily Volume | 0.0000** | 0.0000** | 0.0000 | 0.0000 | 0.0000 | -0.0000 |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| ln(Size) | 563.9005*** | 555.1678*** | 575.7732*** | 2.3855*** | 2.3535*** | 2.4402*** |
| | [18.21] | [18.11] | [18.26] | [0.05] | [0.05] | [0.04] |
| ln(Size) Sq. | -13.3006*** | -13.0934*** | -13.5890*** | -0.0558*** | -0.0551*** | -0.0571*** |
| | [0.44] | [0.43] | [0.44] | [0.00] | [0.00] | [0.00] |
| Std. Dev. Daily Ret. | -389.9708*** | -366.6319*** | -388.2358*** | -5.5948*** | -5.4975*** | -5.5988*** |
| | [47.87] | [47.77] | [47.81] | [0.20] | [0.20] | [0.20] |
| Constant | -6156.4770*** | -6072.3235*** | -6276.4305*** | -26.1106*** | -25.8077*** | -26.6857*** |
| | [213.69] | [211.74] | [213.95] | [0.59] | [0.58] | [0.58] |
| Industry Dummies | Included | Included | Included | Included | Included | Included |
| Quarter Dummies | Included | Included | Included | Included | Included | Included |
| Wald Test $\chi^2$ | 2833.88 | 2932.17 | 2791.93 | 32936.18 | 32940.14 | 32734.49 |
| Observations | 435668 | 435668 | 435668 | 428852 | 428852 | 428852 |
| Wald Test $\chi^2$ Hold Vars | 77.269447 | 248.45461 | 22.174226 | 77.924384 | 231.09075 | 20.891242 |

Table 3.8: **Stock Volume in the Last 30 Minutes of Quarters Pre/Post 2001**

The dependent variable is the normalized volume in the last 30 minutes of quarters, defined as the volume in the last 30 minutes of quarters divided by the average volume in the last 30 minutes of all non month-end days of the same quarter. Pumped equals to one for stocks that are among the top 5 (top 10) percent of stocks most frequently pumped between 1993 and 2001. Inv. Mills is the inverse Mills ratio calculated using the two-step Heckman selection model as described in Section 3.3.3. Post2001 × Pumped and Inv. Mills × Pumped are interaction terms. Other controls are defined as in Table VI. Industry dummies and quarter dummies are included in some Models, but coefficients are omitted for brevity. Robust standard errors are clustered by funds and provided in brackets. Superscripts ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | **5 Percent** | | | **10 Percent** | | |
|---|---|---|---|---|---|---|
| COEFFICIENT | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Pumped | 0.0194 | 3.9399*** | 2.0654*** | 0.0380 | 3.5357*** | 2.5350*** |
| | [0.06] | [0.47] | [0.47] | [0.05] | [0.44] | [0.41] |
| Post2001 x Pumped | -0.3272*** | -0.2973*** | -0.2039** | -0.3744*** | -0.3643*** | -0.2582*** |
| | [0.09] | [0.09] | [0.09] | [0.08] | [0.08] | [0.08] |
| Inv. Mills | | -2.4731*** | -2.9599*** | | -2.1941*** | -3.1187*** |
| | | [0.29] | [0.32] | | [0.27] | [0.33] |
| Inv. Mills x Pumped | | | 2.6175*** | | | 2.3795*** |
| | | | [0.38] | | | [0.29] |
| Post2001 | 0.3636* | 0.2696 | 0.2685 | 0.3966* | 0.3066 | 0.2942 |
| | [0.22] | [0.22] | [0.22] | [0.22] | [0.22] | [0.22] |
| No. Market Maker | -0.0048** | -0.0046** | -0.0047** | -0.0048** | -0.0046** | -0.0048** |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| NASDAQ | 0.4986*** | 0.4149*** | 0.4091*** | 0.4967*** | 0.4190*** | 0.4034*** |
| | [0.07] | [0.07] | [0.07] | [0.07] | [0.07] | [0.07] |
| Quarterly Return | -0.0574 | -0.2669*** | -0.2951*** | -0.0597 | -0.2497*** | -0.3042*** |
| | [0.04] | [0.05] | [0.05] | [0.04] | [0.05] | [0.05] |
| ln(Size) | 2.4415*** | 0.9116*** | 0.6352** | 2.4368*** | 1.0817*** | 0.5405* |
| | [0.16] | [0.29] | [0.30] | [0.16] | [0.28] | [0.30] |
| ln(Size) Sq. | -0.0617*** | -0.0276*** | -0.0214*** | -0.0615*** | -0.0313*** | -0.0190*** |
| | [0.00] | [0.01] | [0.01] | [0.00] | [0.01] | [0.01] |
| Std. Dev. Daily Ret. | 1.0956 | 2.4970*** | 2.7200*** | 1.1283 | 2.3685*** | 2.8183*** |
| | [0.75] | [0.80] | [0.80] | [0.76] | [0.79] | [0.80] |
| Constant | -23.6345*** | -8.0340*** | -5.2691* | -23.6168*** | -9.7854*** | -4.4063 |
| | [1.58] | [2.90] | [3.02] | [1.59] | [2.78] | [3.06] |
| Industry Dummies | Included | Included | Included | Included | Included | Included |
| Quarter Dummies | Included | Included | Included | Included | Included | Included |
| Adj. $R^2$ | 0.0288 | 0.0292 | 0.0293 | 0.0289 | 0.0292 | 0.0293 |
| Observations | 430016 | 430016 | 430016 | 430016 | 430016 | 430016 |

Table 3.9: **Factiva News Stories Count**

This table reports the number of news stories by year that cover portfolio pumping and the number of news stories that cover collusion by Nasdaq market makers. Specifically, Panel A reports the news story count for the Factiva search "portfolio pumping," while Panel B reports results for the search "Christie AND Schultz AND Nasdaq AND Collu*."

| **Panel A: Portfolio Pumping** | | **Panel B: Nasdaq Dealers Collusion** | |
|---|---|---|---|
| Year | News Count | Year | News Count |
| 2000 | 22 | 1994 | 52 |
| 2001 | 63 | 1995 | 71 |
| 2002 | 6 | 1996 | 39 |
| 2003 | 10 | 1997 | 12 |
| 2004 | 6 | 1998 | 8 |
| 2005 | 6 | 1999 | 10 |
| 2006 | 13 | 2000 | 4 |

Table 3.10: **Competing Hypotheses for the Decrease in Portfolio Pumping after 2001**

This table displays OLS regressions of the portfolio pumping measure (Model 1 – 5) and a modified pumping measure that controls for window dressing (Model 6) on an indicator variable for all quarters from 2002 onwards (Post 2001) and four additional variables associated with competing hypotheses. All variables are defined in Table 3.1. Robust standard errors are clustered by funds and provided in brackets. Superscripts ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| COEFFICIENT | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Market Premium | -0.0004 | | | | | |
| | [0.01] | | | | | |
| Sentiment Index | | 1.9629*** | | | | |
| | | [0.15] | | | | |
| Pcnt. Eq. in MF | | | 0.2190*** | | | |
| | | | [0.02] | | | |
| Sixteenth Spread | | | | 2.3762*** | | |
| | | | | [0.19] | | |
| VIX | | | | | 0.3205*** | |
| | | | | | [0.01] | |
| Lagged Pump. Measure | 0.2568*** | 0.2547*** | 0.2537*** | 0.2486*** | 0.2308*** | 0.1166*** |
| | [0.01] | [0.01] | [0.01] | [0.01] | [0.01] | [0.01] |
| Post 2001 | -8.9736*** | -6.8827*** | -10.6955*** | -9.9196*** | -8.1255*** | -4.3292*** |
| | [0.21] | [0.22] | [0.29] | [0.26] | [0.19] | [0.10] |
| Year-End | -0.4664*** | -0.4524*** | -0.4867*** | -0.5583*** | -0.4525*** | -0.7849*** |
| | [0.13] | [0.13] | [0.12] | [0.13] | [0.12] | [0.07] |
| ln(Fund Size) | -0.0126 | -0.0372 | -0.0585 | -0.0617 | -0.0168 | -0.0313 |
| | [0.05] | [0.05] | [0.05] | [0.05] | [0.05] | [0.03] |
| Expenses | 4.3180*** | 4.0491*** | 4.1378*** | 4.0536*** | 4.2095*** | 2.0030*** |
| | [0.84] | [0.84] | [0.83] | [0.83] | [0.84] | [0.42] |
| Turnover | 0.0188*** | 0.0181*** | 0.0183*** | 0.0177*** | 0.0166*** | 0.0055** |
| | [0.01] | [0.01] | [0.01] | [0.01] | [0.01] | [0.00] |
| Fund Age | -0.0021*** | -0.0021*** | -0.0019*** | -0.0017*** | -0.0017*** | -0.0006** |
| | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] | [0.00] |
| Aggressive Growth | 3.8855*** | 4.1242*** | 3.9274*** | 3.9799*** | 4.1209*** | 1.6783*** |
| | [0.52] | [0.54] | [0.52] | [0.52] | [0.52] | [0.25] |
| Growth | -0.4042** | -0.3731** | -0.3851** | -0.3702** | -0.3523* | -0.1109 |
| | [0.18] | [0.18] | [0.18] | [0.18] | [0.18] | [0.09] |
| Small | 8.0291*** | 8.3287*** | 8.0338*** | 8.1165*** | 8.3722*** | 3.5301*** |
| | [0.31] | [0.32] | [0.31] | [0.31] | [0.31] | [0.13] |
| Constant | 7.4963*** | 6.3693*** | 3.9686*** | 6.3957*** | 0.9414** | 1.9750*** |
| | [0.46] | [0.47] | [0.47] | [0.43] | [0.45] | [0.24] |
| Adj. $R^2$ | 0.2559 | 0.2527 | 0.2576 | 0.2584 | 0.2716 | 0.1798 |
| Observations | 61620 | 57792 | 61620 | 61620 | 61620 | 61620 |

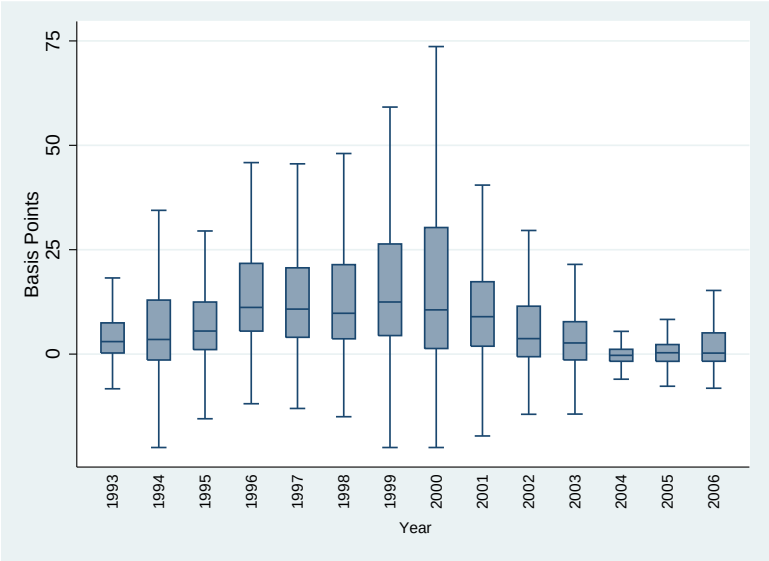
Table 3.11: **Robustness Check: Above Median Market Makers Pumping Measure, No Price Reserval Pumping Measure and High Turnover Sample**

This table displays OLS regressions of a pumping measure exclude stocks with above median number of market makers (Column 1), a pumping measure without requiring price reversals for stocks (Column 2), and the pumping measure for a high turnover sample of funds (Column 3 and 4). Lagged Pump. Measure is the previous quarter value of the respective pumping measure. All remaining variables are defined in Table 3.1. Robust standard errors are clustered by funds and provided in brackets. Superscripts ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

| | Above Median Market Maker | Pump. Measure No Reversal | Top Quartile In Turnover | Top Half In Turnover |
|---|---|---|---|---|
| Post 2001 | -0.7011*** | -10.1206*** | -11.1650*** | -10.0968*** |
| | [0.04] | [0.25] | [0.37] | [0.25] |
| Past Perf. Q1 (Worst) | 0.1570*** | 0.9042*** | 0.0961 | 0.3478 |
| | [0.05] | [0.20] | [0.38] | [0.26] |
| Past Perf. Q2 | 0.034 | -0.1516 | -0.518 | -0.3322 |
| | [0.04] | [0.19] | [0.37] | [0.25] |
| Past Perf. Q4 | 0.0213 | 0.5268*** | 0.5565 | 0.6853** |
| | [0.03] | [0.19] | [0.41] | [0.27] |
| Past Perf. Q5 (Best) | 0.1370* | 1.9478*** | 3.6518*** | 2.8054*** |
| | [0.07] | [0.25] | [0.49] | [0.31] |
| Lagged Pump. Measure | 0.0307** | 0.4053*** | 0.2651*** | 0.2760*** |
| | [0.01] | [0.01] | [0.01] | [0.01] |
| ln(Fund Size) | -0.0702*** | 0.0625 | -0.0349 | -0.0694 |
| | [0.01] | [0.06] | [0.11] | [0.08] |
| Expenses | 0.6358*** | 5.0609*** | 3.9852** | 3.8936*** |
| | [0.23] | [1.03] | [1.68] | [1.28] |
| Turnover | -0.0018*** | 0.0280*** | -0.0064 | 0.0027 |
| | [0.00] | [0.01] | [0.01] | [0.01] |
| Fund Age | 0 | -0.0025*** | -0.0040*** | -0.0023*** |
| | [0.00] | [0.00] | [0.00] | [0.00] |
| Aggressive Growth | 0.4609*** | 4.9260*** | 2.8606*** | 3.4947*** |
| | [0.11] | [0.60] | [0.72] | [0.58] |
| Growth | 0.0281 | -0.1035 | -1.8442*** | -1.1988*** |
| | [0.03] | [0.20] | [0.42] | [0.28] |
| Small | 1.0694*** | 9.3852*** | 7.9998*** | 7.9576*** |
| | [0.09] | [0.38] | [0.55] | [0.38] |
| Constant | 0.6183*** | 10.5871*** | 10.7079*** | 8.8631*** |
| | [0.11] | [0.55] | [1.03] | [0.69] |
| Adj. $R^2$ | 0.0193 | 0.3728 | 0.2764 | 0.2787 |
| Observations | 61620 | 61620 | 15236 | 30468 |

Figure 3.1: **Changes in Portfolio Pumping over Time**

**Panel A: Portfolio Pumping by Year**




**Panel B: Decrease in Portfolio Pumping by Quarter**

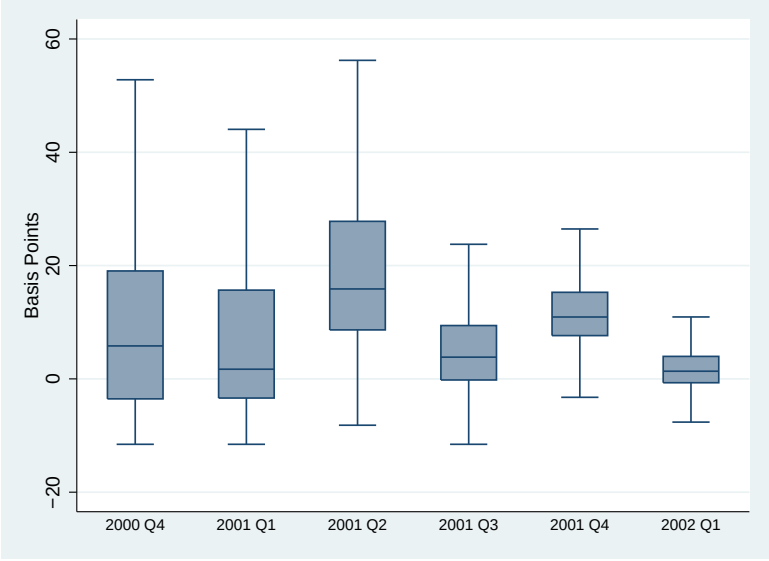
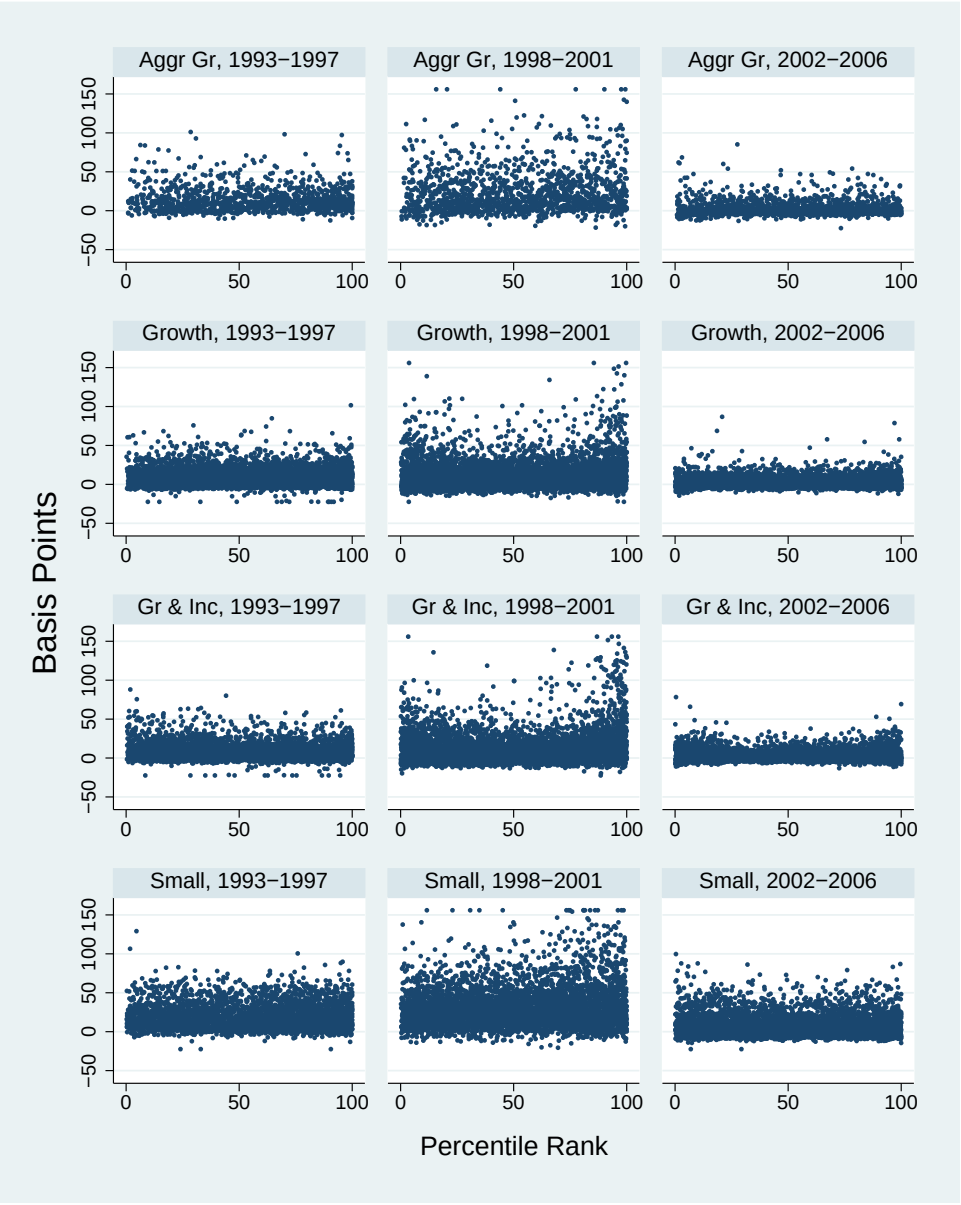


Figure 3.2: **Portfolio Pumping by Investment Style and Period**



# Bibliography

[1] Vikas Agarwal, Naveen D. Daniel, and Narayan Y. Naik. Why is santa so kind to hedge funds? the december return puzzle! Working Paper, London Business School, 2007.

[2] Malcolm Baker and Jeffrey Wurgler. Investor sentiment in the stock market. *Journal of Economic Perspectives*, 27(2):129–151, 2007.

[3] Suleyman Basak, Anna Pavlova, and Alex Shapiro. Optimal asset allocation and risk shifting in money managemen. *Review of Financial Studies*, 20(5):15831621, 2007.

[4] William J. Baumol, Stephan M. Goldfeld, Lilli A. Gordon, and Michael F. Koehn. The economics of mutual fund markets: Competition versus regulation. *Kluwer Academic Publishers*, 1990.

[5] Dan Bernhardt and Ryan J. Davies. Painting the tape: Aggregate evidence. *Economic Letters*, 89:306–311, 2005.

[6] Dan Bernhardt and Ryan J. Davies. Smart fund managers? Stupid money? Working Paper, University of Illinois and Babson College, 2008.

[7] Hendrik Bessembinder. Execution costs and market quality after decimalization. *Journal of Financial and Quantitative Analysis*, 38(4):747–777, 2003.

[8] Sugato Bhattacharyya and Vikram Nanda. Portfolio pumping, trading activity and fund performance. Working Paper, University of Michigan and Arizona State University, 2006.

[9] Keith C. Brown, W.V. Harlow, and Laura T. Starks. Of tournaments and temptations: An analysis of managerial incentives in the mutual fund industry. *Journal of Finance*, 51(1):85–110, 1996.

[10] Jeffrey A. Busse. Another look at mutual fund tournaments. *Journal of Finance*, 36(1):53–73, 2001.

[11] Dalton Camp. Time for TSE to come clean in this royal 'juicing' scandal. *The Toronto Star*, July 19, 2000.

[12] Mark M. Carhart. On persistence in mutual fund performance. *Journal of Finance*, 52:57–82, 1997.

[13] Mark M. Carhart, Ron Kaniel, David K. Musto, and Adam V. Reed. Leaning for the tape: Evidence of gaming behavior in equity mutual funds. *Journal of Finance*, 58(2):661–693, 2002.

[14] George Cashman and Daniel N. Deli. Locating decision rights: Evidence from the mutual fund industry. Working Paper, 2006.

[15] Joseph Chen, Harrison Hong, and Jeffrey D. Kubik. Outsourcing mutual fund management: Firm boundaries, incentives and performance. Working Paper, 2007.

[16] Judith Chevalier and Glenn Ellison. Career concerns of mutual fund managers. *Quarterly Journal of Economics*, 114:389–432, 1999.

[17] Judtih Chevalier and Glenn Ellison. Risk taking by mutual funds as a response to incentives. *Journal of Political Economy*, 105(6):1167–1200, 1994.

[18] William G. Christie, Jeffrey H. Harris, and Paul H. Schultz. Why did NASDAQ market makers stop avoiding odd-eighth quotes. *Journal of Finance*, 49(5):1841–1860, 1994.

[19] William G. Christie and Paul H. Schultz. Why do NASDAQ market makers avoid odd-eighth quotes. *Journal of Finance*, 49(5):1813–1840, 1994.

[20] William G. Christie and Paul H. Schultz. Did Nasdaq market makers implicitly collude? *Journal of Economic Perspectives*, 9(3):199–208, 1995.

[21] Susan E. K. Christofferson and David K. Musto. Demand curves and the pricing of money management. *Review of Financial Studies*, 15:14991524, 2002.

[22] Gjergji Cici, Scott Gibson, and Rabih Moussawi. For better or worse? Mutual funds in side-by-side management relationships with hedgefunds. Working Paper, 2007.

[23] Sean Collins. Reports of 'portfolio pumping' by mutual funds: A closer look. *Investment Company Institute*, 2004.

[24] Eugene F. Fama and Kenneth R. French. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33:3–56, 1993.

[25] Eugene F. Fama and James D. MacBeth. Creturn and equilibrium: Empirical tests. *Journal of Political Economy*, 81:607–636, 1973.

[26] David R. Gallagher, Peter Gardner, and Peter L. Swan. Portfolio pumping: An examination of investment manager quarter-end trading and impact on performance. 2008. Forthcoming, Pacific-Basin Finance Journal.

[27] Jose-Miguel Gaspar, Massimo Massa, and Pedro P. Matos. Favoritism in mutual fund families? Evidence on strategic cross-fund subsidization. *Journal of Finance*, 61:33–71, 2006.

[28] Scott Gibson, Rajdeep Singh, and Vijay Yerramilli. The effect of decimalization on the components of the bid-ask spread. *Journal of Fixed Income*, 12(2):121–148, 2003.

[29] Gene M. Grossman and Elhanan Helpman. Integration versus outsourcing in industry equilibrium. *Quarterly Journal of Economics*, 117:85–120, 2002.

[30] Sanford Grossman and Oliver Hart. The costs and benefits of ownership: A theory of vertical and lateral ownership. *Journal of Political Economy*, 94:691–719, 1986.

[31] Sara Hansard. SEC probing funds for 'portfolio pumping': Task force seeks trade records to examine stock purchases. *Investment News*, November 27, 2000.

[32] Oliver D. Hart and John Moore. Propoerty rights and the nature of the firm. *Journal of Political Economy*, 98:1119–1158, 1990.

[33] Miriam Hill. Investors should be wary of last-day fund inflation. *Knight Ridder Tribune Business News*, January 4, 2000.

[34] Mark Hulbert. They did it again. *CBS MarketWatch*, July 2, 2004.

[35] Richard A. Ippolito. A consumer reaction to measures of poor quality: Evidence from the mutual fund industry. *Journal of Law and Economics*, 35(1):45–70, 1992.

[36] Narasimhan Jegadeesh and Sheridan Titman. Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance*, 48:93–130, 1993.

[37] Marcin Kacperczyk, Clemens Sialm, and Lu Zheng. Unobserved actions of mutual funds. Forthcoming, Review of Financial Studies, 2006.

[38] Alexander Kempf and Stefan Ruenzi. Tournaments in mutual fund families. Forthcoming, Review of Financial Studies, 2005.

[39] Ajay Khorana. Top management turnover: An empirical investigation of mutual fund managers. *Journal of Financial Economics*, 40:403–427, 1996.

[40] Ajay Khorana. Performance changes following top management turnover: Evidence from open-end mutual funds. *Journal of Financial and Quantitative Analysis*, 36:371–393, 2001.

[41] Ajay Khorana and Henri Servaes. Conflict of interest and competition in the mutual fund industry. Working Paper, 2005.

[42] Albert S. Kyle. Continuous auctions and insider trading. *Econometrica*, 53(6):1315–1335, 1985.

[43] John Labate and Elizabeth Wine. SEC probes mutual funds. *Financial Times*, November 30, 2000.

[44] Kai Li and N.R. Prabhala. *Handbook of Corporate Finance: Empirical Corporate Finance*. North Holland, 2007.

[45] Massimo Massa. How do family strategies affect fund performance? When performance-maximization is not the only game in town. *Journal of Financial Economics*, 67:249–315, 2003.

[46] Phil McCarty. SEC set to adopt mutual fund name rule by year-end. *Dow Jones Newswires*, October 12, 2000.

[47] Janet McFarland, Karen Howlett, and Dawn Walton. Signs point to mutual fund high-closing: Many routinely post strong gains on the final day of the year and far outstrip the performance of the TSE 300, the globe finds. *The Globe and Mail*, July 5, 2000.

[48] Felix Meschke. An empirical examination of mutual fund boards. Working Paper, 2008.

[49] David K. Musto. Portfolio disclosures and year-end price shifts. *Journal of Finance*, 52(4):1563–1588, 1997.

[50] David K. Musto. Investment decisions depend on portfolio disclosures. *Journal of Finance*, 54(3):935–952, 1999.

[51] Tom Nohel, Zhi Jay Wang, and Lu Zheng. Side-by-side management of hedge funds and mutual funds. Working Paper, 2008.

[52] Edward S. O'Neal. Window dressing and equity mutual funds. Working Paper, Wake Forest University, 2001.

[53] Mitchell A. Petersen. Estimating standard errors in finance panel data sets: Comparing approaches. Forthcoming, Review of Financial Studies, 2007.

[54] Jonathan Reuter. Are IPO allocations for sale? Evidence from mutual funds. *Journal of Finance*, 61(5):2289–2324, 2006.

[55] Jay R. Ritter. The long-run performance of initial public offerings. *Journal of Finance*, 46(1):3–27, 1991.

[56] W.H. Rogers. Regression standard errors in clustered samples. *Stata Technical Bulletin*, 13:19–23, 1993.

[57] G. William Schwert. Using financial data to measure effects of regulation. *Journal of Law and Economics*, 24(1):121–158, 1981.

[58] Nicolaj Siggelkow. Why focus? A study of intra-industry focus effects. *Journal of Industrial Economics*, 51:121–150, 2003.

[59] Eric R. Sirri and Peter Tufano. Costly search and mutual fund inflows. *Journal of Finance*, 53:1589–1622, 1998.

[60] Samuel Thompson. A simple formula for standard errors that cluster by both firm and time. Working Paper, 2005.

[61] Peter Tufano and Matthew Sevick. Board structure and fee-setting in the U.S. mutual fund industry. *Journal of Financial Economics*, 46:321–355, 1997.

[62] Russ Wermers. Is money really 'smart'? New evidence on the relation between mutual fund flows, manager behavior, and performance persistence. Working Paper, University of Maryland, 2003.

[63] Lu Zheng. Is money smart? A study of mutual fund investors' fund selection ability. *Journal of Finance*, 54(3):901–933, 1999.

[64] Jason Zweig. Watch out for the year-end fund flimflam. *Money Magazine*, November:130–133, 1997.