The Effects of Organizational Forms of Mutual Fund Management Company on Mutual Fund Performance

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Master of Science in Management (Finance)

Submitted in partial fulfillment
of the requirements for the degree of

Master of Science in Management (Finance)

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Abstract

The organizational form of a company indicates whether it is publicly-traded or privately-held. The effects of the organizational forms on a company's operations and performances have been well documented. However, because the organizational form of companies in the finance industry is so different from those in other industries, the effect on performance is quite different. There has been little research done to determine how the organizational form of mutual fund management companies affect the performance of their mutual funds.

This thesis examines the impact of mutual fund management companies on the performance of their managed funds using data that cover the period 2007 to 2016 on 782 different firms. The results showed that the performance of mutual funds managed by publicly-traded mutual fund management companies was significantly compared to those managed by privately-held companies. Based on the sample data, the hypothesis of this thesis is that publicly-traded and privately-held fund management companies have different incentives and interests that impact mutual fund performance. The thesis also addresses the issues of discontinuous returns and endogenous organizational form variables. The test results examined in this thesis support the notion that mutual funds managed by publicly-traded companies underperform compared to industry

benchmarks. In addition, funds managed by publicly-traded management companies perform poorer in general compared to funds managed by privately-held companies.

Key Words: mutual funds, organizational forms, performance

Table of Contents

List of Tables

Chapter 1

Introduction

Mutual funds have been one of the most important investment vehicles since the 1980s, as they provide investors with asset diversification, day-to-day liquidity, lower costs, and professional money management. The mutual funds market had dramatically expanded during the 1990s' bull market. By the end of the period, about $6[1] trillion was flowing into the mutual fund industry. Growth in the mutual fund industry slowed down after being hit hard by the 2003 mutual fund scandal and the 2008-2009 financial crisis. However, by the end of 2015, US households still held approximately $15.65 trillion US dollars in the mutual fund market, which represented 89% of the assets in the financial market. 43% of US households invested in mutual funds, and the percentage has remained stable since the year 2000. The number of funds sponsored companies have been growing as well. A total of 873 companies offered investment management services to investors in the US market in 2015, with 594 new funds recorded at that time, bringing the total number of funds in the United States mutual fund market to 9,520. The purpose of this study is to explore whether the organizational form of a management company affects the performance of the mutual funds under their management.

On August 14th, 2017, Aberdeen Asset Management Company completed its merger with Standard Life. The new company Standard Life Aberdeen became one of

[1] Information in this paragraph comes from 2016 Investment Company Fact Book

the world's largest asset management companies with assets under their management totaling $871 billion[2]. Listed on the London Stock Exchange in 1991, Aberdeen Asset Management has become the third largest publicly traded investment company in Europe. The company also expanded quickly through acquisitions since the year 2000. However, due to its focus on emerging markets, the performance of the funds under its management has been unsatisfactory to investors in the recent years. The poor performance can be attributed to the turbulence in the global emerging market. Since then, Aberdeen Asset Management has suffered dramatically with volatile money flows. And their stock price has declined. This example demonstrates how the mutual fund performance and general company performance is significantly related, even though the market lags in reacting to this change. Evidence also shows that the performance of publicly-held companies in the stock market is more sensitive to the performance of their mutual funds compared to their ability to attract money flows.

Unlike ordinary corporations, mutual funds have a unique governance structure. Each mutual fund is owned by shareholders and is supervised by a board of directors. The board is responsible for implementing investment activities, setting up investment objectives and more importantly, appointing a management company for the fund. The management company appoints one or more managers, who are responsible for determining the composition of fund portfolios within the funds' objectives. In most cases, a management company takes care of more than one fund, or in other words, a combination of funds with different investment objectives, which offers diversification

[2] Standard Life Aberdeen Home Page.

to fund investors. However, mutual funds under the same management company are operated separately. The organizational forms of these fund management companies are either public or, which is private, similar to companies in other industries.

The question of whether the organizational forms of mutual fund management companies affects fund performance has been largely ignored. Berkowitz and Qiu (2001), and Ferris and Yan (2008) showed that mutual funds of listed management companies performed poorer than those of privately-holding companies.

In the mutual fund industry, there are management companies deciding to go public every year, especially the large ones. Even though most of the fund management companies are still privately-holding companies, when considering the total net asset value of investment companies, only 4 out of the 10 largest asset investment companies in the US market are private[3].

In my research for this thesis, I adopt a sample of 782 management companies and 4,200 mutual funds which have been under the management of those companies in the sample period between 2007 to 2016. By using manually collected data about the management company's organizational form, I find that the mutual fund performance of publicly-traded management companies is poorer compared to that of privately-held companies. My findings are consistent with Ferris and Yan's (2008) study, whereby comparing the risk-adjusted performance generated with different asset pricing models, funds managed by privately-held management companies seem to perform better than

[3] Vanguard Group, Fidelity Investment, Capital Group, and Goldman Sachs are Private companies. Black Rock, State Street Global Advisor, J.P. Morgan Asset Management, BNY Mellon, PIMCO, Prudential Financial are public companies.

those managed by publicly-traded companies. The market-timing factors are also included as a benchmark in the estimation of mutual fund performance. Furthermore, I conduct additional analysis to regress risk-adjusted performance on public organizational form dummies and other control variables, in order to examine how much organizational form affected mutual fund performance. The result is a negative market-timing ability, which suggests that mutual fund managers often fail to accurately forecast the market in general. The results of a preset test on the endogeneity problem in terms of the organizational structure show that mutual fund performances decline more for the companies choose to go public compared to those keep on private form at the same time, by a difference of 0.07%. This evidence aligns to the hypothesis that publicly-traded management companies have a negative effect on their mutual fund performance.

This study contributes to two areas of research. First, while there is a wealth of literature on the impact of ownership structures on corporate performance, there are not many studies focused on mutual fund markets, despite the evidence that supports that it is generally a mixed effect. Moreover, this study provides evidence that proves the negative effect of publicly-traded management companies on their fund performance in comparison to privately-held companies, using a multivariate analysis. Second, the endogeneity problem of organizational structure as an independent variable is also addressed, and a method to test whether it has an influence on the negative effect of organizational structure on mutual fund performance is proposed. By adopting the propensity score matching, I matched a group of companies who went public to a group

of companies who kept private at the same time with similar characteristics. By analyzing changes of mutual fund performances of these companies, I found that after a privately-held company goes public, the performance of their mutual funds and the performance of the matched group funds whose companies kept private at the same time tends to decline, compared to prior to the public offering. However, the decline of mutual fund performance is larger for the companies who chose to release initial price offering.

The rest of this thesis is organized as follows: Chapter 2 presents the literature review on related studies and testable hypothesis. Chapter 3 presents the data and summary statistics. Chapter 4 presents the methodology to test the relation between mutual fund performance and the organizational form of mutual fund management companies. Chapter 5 presents the findings of the empirical test in detail to support the hypothesis. Chapter 6 presents the discontinuity problem of the data of mutual fund returns and the endogeneity problem of organizational structures. Then I provide tests to the problem. Chapter 7 is the summary of the results.

Chapter 2

Literature Review and Hypothesis

2.1 Mutual Fund Performance Measure

Researches on the measurement of investment performance can be dated back to the early studies of Sharpe and Jensen in the 1960s, but many new methods have been developed in the recent years. The performance of mutual funds is primarily measured by the excess risk-adjusted return of the portfolio relative to the systematic risk benchmarks.

Jensen's alpha, also known as the abnormal return, is the most widely used measure of mutual fund performance. First introduced by Jensen in 1968, the measure focused on the actively managed portfolio's excess return compared to the return of a benchmark market portfolio with the same risk exposure. Jensen built his study based on the earlier study of Sharpe's (1964) Capital Asset Pricing Model (CAPM), in which he employed the market portfolio return as a benchmark to find out how much value the service of an active manager added to the portfolio. An alpha that is positive and significant shows the fund is generating excess returns compared to the risk it is expected to take during the period. On the contrary, a negative alpha indicates the fund is not generating enough return compared to the risk it is taking in the same period.

However, an alpha is not sufficient to evaluate a fund manager's capability to benefit the investment. Fama (1972) argued that mutual fund performance is facilitated by both selectivity and market-timing ability. If these two factors are not taken into

account when measuring an investment's performance, the results will be biased and misleading. The measurement of a fund manager's market-timing ability was first introduced by Treynor and Mazuy (1966). They argued that with the ability to forecast the market movement, a mutual fund manager would be able to adjust the risk-taking of the portfolio along with the change of economic environment, and, in turn, adjust the portfolio return. Due to the convexity relation between market return and portfolio return, they adopted a quadratic term of excess market return in their market-timing model to account for the non-linearity.

Although CAPM has been broadly adopted as a benchmark model in financial studies since its appearance, many researchers questioned the exactitude of CAPM. Roll (1978) critiqued that the real market portfolio was unobservable and the one made by CAPM may not be an efficient single market index. Therefore, measuring a portfolio's performance by calculating Jensen's alpha based on an inefficient single market index may lead to a biased estimation.

Once the inefficiency and testability problems of the single market risk factor model were recognized, researchers began to explore multi-factors asset pricing models to substitute the CAPM benchmarks in the 1970s. Ross (1976) developed the Arbitrage Pricing Model. Instead of using only one systematic risk factor in CAPM, he used a set of K risk factors to include all possible affecting resources for the portfolio's return, setting a new benchmark model to evaluate investment performance.

Instead of using portfolios with the same risk exposures as the benchmark, researchers have focused on studying style-based exposures benchmarks since the

1990s. Fama, French, and Carhart have made major improvements in measuring performance. Fama and French (1993) introduced size and book-to-market factors to the initial CAPM model, creating the Fama-French three-factor model. Fama and French's findings of the empirical study with stock data from 1963 to 1990 showed that risk exposure was stronger and more significant from size and book-to-market compared to that from the excess market return. They also demonstrated that the three-factor model better explains the volatility in investment returns. Carhart (1997) extended the asset pricing model based on the observable fact that the well-performing stock in the past tends to outperform in the near future period compared to other stocks. He built a four factors model by adding a momentum factor, which is the difference between the returns of high-yield and low-yield portfolios over the previous period, in addition to the three Fama-French factors.

Although widely adopted, traditional unconditional performance measure methods still carry major disadvantages as they have not considered the information available to investors of the managed portfolio at the time the returns were yielded (Christopherson, Ferson & Glassman, 1998) and the likelihood of changing states of the economy (Ferson & Schadt, 1996). Unconditional models may produce incorrect estimations, especially when portfolio managers adopt dynamic strategies using publicly available information that is also accessible to any investors. Given that expected returns and risk exposure are changing with time, Ferson and Schadt (1996) proposed a conditional model to evaluate investment performance. This model took beta conditional on predetermined lagged information in a linear relation. Shortly after, the conditional

model was expended to make alpha conditional on time, in a linear relation, as well as a conditional beta by Christopherson, Ferson and Glassman (1998). They found that fund performance was generally better with higher alphas compared to the poor performance indicated by unconditional models. Through a separate review of US domestic equity mutual funds during the years of recession and expansion from 1962 to 2005, Kosowski (2011) showed in his study that average mutual fund performance underperforms market benchmarks in expansions, but not in recessions, which provided evidence that underperformance results from unconditional methods are undervalued in a recession.

Since Grinblatt and Titman (1993) introduced a holding-based performance measure, new insights have been revealed in fund performance studies. They examined holding data in mutual funds from 1976 to 1985 and discovered that active growth-funds outperformed other funds. Holding-based methods avoid style shift problems, providing information about a manager's ability regarding asset allocation and security selection, making benchmarks more precise. However, holding data for mutual funds are disclosed quarterly, which limits the usefulness of the performance measure. Elton (2010) stated that using monthly holding data provides changes or reversed results to those using quarterly-holding data since monthly data can capture more trades. Kacperczyk, Sialm, and Zheng (2008) found a gap exists on each fund between the reported monthly return and the estimated returns of the reported holdings, which is persistent and can predict future fund performance.

Many researchers using style-based methods have provided evidence to show that

average active US mutual funds underperformed in the market with a negative alpha. Fama and French (2010) re-examined the data of monthly returns of mutual funds during 1984-2006 and concluded that managers lacked skills to add value to the mutual funds they managed. The performance of the funds was inconsistent over time (Gruber, 1996; Carhart, 1997; Berk & Green, 2004), especially for these outperformed funds. Thus, the conclusion is widely accepted that the fates of outperformed funds are mainly led by luck, versus the skills of a fund manager. But even so, it remains a mystery why investors still invest in actively managed funds.

Some literature has provided evidence to prove the tangible skills and benefits of managerial skills. (Wermers, 2003; Kacperczyk, Sialm, & Zheng, 2008; Cremers & Petajisto, 2009) Berk and Green (2004) found that actively managed funds do not outperform passive ones, but their flow-performance relation proves that high-level skills so exist among managers. Berk and van Binsbergen (2012) argued that rather than alpha, manager skills can only be measured by the dollar value they add. They found evidence to show that managers do have skills to add value to reach about $2 million a year and the results persist.

2.2 Ownership Structure, Fund Characteristics, and Performance

The impact of different organizational forms has been a sustained interest topic to financial researchers, which can be dated back to the 1930's. Many prior studies have researched how organizational forms affect corporate performance. It has been well recognized that the organizational forms of management companies are similar to other

corporations' characteristics that influence corporate performance.

Jensen and Meklin(1976) put forward the theory of agency problem and pointed out that there was a conflict of interest between the company's managers and shareholders due to the separation of ownership and management. That offers incentives for managers to act inconsistently with shareholders' expectations to maximize their utility, such as by consuming perquisites from the company to benefit themselves. Later, Fama and Jensen (1985) showed that different organizational forms influence corporate decision making.

The concentrated level of ownership is related to corporate performance. Grossman and Hart (1980) and Shleifer and Vishny (1986) believes that large shareholders preferred to play a bigger role and have greater power in corporate decision-making which is a solution to free-riding problems in takeover bids. This was consistent with the view that greater concentration of ownership will improve the efficiency of corporate governance. Due to more dispersed interests of mutual fund management companies and shareholders, publicly-traded companies suffer more than private companies in terms of government mechanism and investment efficiency (Chen et al., 2011). Compared with public companies, private firms are more likely to have large shareholders in dominant positions and thus have more efficient management than publicly-traded companies.

From the liquidity perspective, stockholders of publicly-traded companies can easily leave the company in a bad state, while on the contrary, those in privately-holding companies have no escape (Bhide, 1993). Bolton and Thadden (1998) showed there is

a trade-off effect on the liquidity benefit and less efficient management of concentration of ownership. Cole and Mehran (1998) recognized a significant positive relationship between corporate performance and concentration of ownership in their empirical study about thrift institutions.

Furthermore, under the requirement for quarterly disclosure and annual reports, publicly-traded companies face pressure to perform and meet targets in a short period of time, while private companies are not subject to the same stresses and are less concerned about short-term performance (Froot et al., 1992). Therefore, private companies have incentives to make decisions that better align with shareholders' interests in the long-run compared to public companies.

However, being publicly-traded can also benefit a company's investment activities. Mortal and Reisel (2013) stated that public companies could access outside capital more easily and are more sensitive to growth opportunities. Allee, Badertscher and Yohn (2015) examined the profitability of publicly-traded companies compared with private companies in their empirical studies using a large cross-secession and a propensity-matched sample of public-traded and privately-held firms. The results show that these public companies are more profitable in the next three and five years compared to private companies.

In recent years, some researchers have provided insight into how organizations themselves impact incentives and mutual fund performance. Massa and Zhang (2009) found that the internal organizational structure of asset management companies is affecting their mutual fund strategies and performance, which is consistent with Stein's

(2002) theory that a more hierarchical structure is related to lower performance. Berkowitz and Qiu (2002) examined 12 Canadian fund management companies and 446 mutual funds managed by them in June 1998. Through the comparison of fund performance between publicly-traded and privately-held companies, they attempted to figure out how the organizational form of the management company influenced fund performance. They showed that publicly-traded companies charge higher management fees and invest in riskier assets, but their funds did not outperform the funds of private companies. Ferris and Yan (2009) have found consistent results in their empirical study. They examined characteristics and performance of all mutual funds belonging to 750 fund families between 1992 and 2004. By setting publicly-traded companies as a dummy in the organizational form variable, they found evidence that management companies with different organizational forms suffer differently from agency costs. Their study showed that publicly-traded mutual fund management companies suffered more from agency costs by controlling more funds, charging higher fees, and underperforming more often than private companies.

Sialm and Tham (2015) examined the spillover effect of publicly-traded mutual fund management companies on fund performance based on the data of 2,303 equity funds and 1,462 bond funds belonging to 118 publicly traded companies in 1992-2009. Their results showed that past share prices of fund management companies are positively correlated with mutual fund performance and future fund inflows.

Adams, Mansi and Nishikawa (2013) showed that publicly-traded firms reacted faster to fund managers performance and replaced poor performing managers more

quickly than privately managed funds did. Their findings provided evidence that different incentives amongst publicly-traded and privately-held companies affect their internal governance mechanism.

The cause and effect of agency conflicts in the finance industry have been spotlighted by many researchers (Cohen & Starks, 1988; Brown et al., 1996; Chevalier & Ellison, 1997; Mahoney, 2004). The compensation of mutual fund management companies is usually a certain percentage of a fund asset under management and not directly related to the fund's performance. As such, compensation incentives exist for mutual fund management companies to increase assets under management by attracting capital inflows instead of promoting fund performance.

The studies surrounding the agency problem of mutual fund industry in previous literature focused more on the relationship between fund managers and investors. Agency conflict brings incentives for fund managers to strategically shift risk-taking. Brown et al. (1996), Chevalier and Ellison (1995) stated that underperforming fund managers in the first half-year were more likely to increase risk in the next six months. On the contrary, managers of well-performing funds tended to reduce their risk-taking mid-year, as long as they were able to keep the advantage. However, Kempf, Ruenzi and Thiele (2008) argued that there was a trade-off effect between fund managers' compensation incentives and employment incentives, which makes poorly performing fund managers choose to decrease investment risks. The effect was highly dependent on the market environment. For example, compensation incentives were weaker in a bear market, but stronger in a bull market compared to employment incentives. Since

there was less money mutual for fund management companies to attract in the bear market, they were more concerned about survivability rather than outperforming their competitors (Karceski, 2002). Huang, Sialm, and Zhang (2011) stated that risk transfer activities are associated with poor performance and could be caused by inferior skills or agency issues.

Since the Securities and Exchange Commission (SEC) required mutual funds to disclose how much managers invest in funds under their management in 2004, Khorana et al. (2007), Evans (2008) and Cremes et al. (2009) have all documented in their empirical studies that the ownership of funds managed by the fund managers themselves is positively correlated with fund performance and funds managed by a manager with small stakes significantly underperformed. This result is consistent with the theory of the agency problem where the lower the managerial ownership is, the more dispersed the manager's interest was, compared to that of investors, and therefore increasing agency costs.

How characteristics and behaviours of fund managers impact fund performance have become a hot topic for financial researchers. Chevalier and Ellison (1999) contended that mutual fund performance is sensitive to characteristics of fund managers, such as tenure, education, and SAT score. Fund management fees are directly related to managers' incentives to monitor the mutual funds they oversee

But similarly, management companies are different from ordinary companies as they have special governance structure and regulations. It is important to understand how fund governance works and affects fund performance. Wellman and Zhou (2007)

and Chen and Huang (2011) examined the Morningstar Stewardship Grades on mutual fund governance, first released in 2004, as well as fund performance. They recognized the close relationship between governance grades and fund performance, which was consistent with the conclusion that the corporate governance of ordinary companies significantly affected performance.

Tufano and Sevick (1997) found that to be more efficient, more active, and less tolerant to underperformance, the board of directors of mutual funds usually consisted of fewer directors but a higher percentage of independent directors. Boards with these criteria also have higher manager turn-over rates and better performance.

2.3 Hypothesis

Prior studies have looked at the agency problem between asset management companies and investors (Brown et al., 1996; Chevalier & Ellison, 1995; Kempf, Ruenzi and Thiele, 2008; Ferris & Yan, 2009). Publicly-traded and privately-held fund management companies have different incentives for mutual fund performance due to different conflicts of interest. It has been recognized that many aspects of a fund manager’s investment behaviuor, such as strategy, level of risk-taking and trading frequency, directly affect the performance of the mutual funds they managed and are driven by their incentives. The organizational form of a fund management company determines the incentives provided to fund managers, and therefore indirectly affects the performance of the managed mutual fund. However, the existing evidence is not strong enough to prove the correlation between organizational form and its mutual fund

performance.

Under the stress of information disclosure, publicly-traded management companies have shorter time-horizons and are more sensitive to performance compared to private companies. Funds managed by publicly-traded management companies have higher management fees, higher risks, and higher management turnover. There is a significant correlation between the stock prices of publicly-traded management companies and their fund performance, which is unavailable for private companies. Since the differences between publicly-traded and privately-held companies that can be translated to fund management companies, I argue that different organizational forms of fund management companies have different effects on mutual fund performance.

These discussions lead to my hypothesis that different organizational forms of mutual fund management companies have different effects on the incentives to prompt the performance of their mutual funds. Thus, my testable hypothesis is as follows:

Hypothesis:

Mutual funds managed by publicly-traded companies perform poorly when compared to funds managed by privately-held companies.

Chapter 3

Data, and Summary Statistics

3.1 Data

In this study, the data used comes from two sources: (1) the Survivor Bias-Free Mutual Fund Database from the Center for Research in Security Prices (CRSP) and (2) Bloomberg Terminal.

CRSP contains information on monthly returns and yearly characteristics of mutual funds including information about total net assets, expense ratios, turnover ratios, initial offering time, manager names and management company names.

The original sample includes all actively managed funds from CRSP between 2007[4] and 2016. There are 782 management companies that CRSP has information about and there are 4,200 funds that belong to these companies. In regard to funds offering multiple share classes, only one share class is kept, and the others are removed to avoid duplicate counting.

The data about organizational forms are manually collected from Bloomberg Terminal which contains information about whether a company is publicly-listed or privately-held, as well as the family tree of parent and subsidiary companies. In this thesis, a company is defined as a publicly-traded company if the company itself or its parent company is traded publicly. A company is defined as a privately-held company if neither it nor its parent company is publicly traded.

[4] The start year is set at 2007 because of the availability of the data of the manager's ownership of the fund.

The company's IPO date data is also manually collected from Bloomberg Terminal. The IPO of a company in this study indicates that a company has transferred from a privately-held company to publicly-listed company. The transition includes an initial public offering of the company's shares as well as a merger of a private company by a public company. In very rare case, a public company or its subsidiaries could be acquired by a private company. There was only one company in my original sample with this case and it is removed from the data.[5]

3.2 Summary Statistics

Summary statistics on the sample are presented at fund management company level in Table 1, and mutual fund level in Table 2.

[Please insert table 1 here]

The sample contains 4,200 actively managed mutual funds belonging to 782 fund management companies during from 2007-2016. Six hundred and twenty-six of the fund management companies are privately-held companies, and only 156 of them are publicly-traded companies. The public mutual fund management companies are larger in size, measured by total net assets. The average total net assets of public companies are 3 times larger than private companies. However, since there are more private

[5] I acknowledge that governance mechanisms that relate to different incentive structures can ultimately explain the variation in performance of managed firms. This thesis does not account for differences in board structures and managers ownership because of the lack of data especially for privately held firms.

management companies than public ones, the overall numbers of total net assets of both forms of companies are close. Public management companies provide more funds in the financial market compared to private companies. On average, each public company offers and manages 152 funds, 6 times the number of private companies.

[Please insert table 2 here]

According to Table 2, there are 2,230 funds that belong to private mutual fund management companies, accounting for 53% of the total in the sample, and the others belong to public mutual fund management companies. Only 20% of the fund management companies are publicly-traded, but they manage 47% of sample funds. Private mutual fund management companies managed larger assets, which is 345 million more than public companies on average and the difference is statistically significant. In terms of expense ratio, the private companies in the sample have a slightly larger average of expense ratio, at an average of 0.18% more than public companies. The private companies also have a higher turnover ratio, which indicates that managers in private companies are more active in achieving their goals in managing mutual funds. The average age of the mutual funds of these public and private companies are extremely close with a mean difference of 0.283 more for private company funds. There are 3,137 funds managed by a team that contains at least two managers, which accounts for 74.7% of all sample funds. The rate of team managed funds for public and private companies are close at 75.9% for funds under public companies and 73.5% for funds under private companies. The mean differences for

control variables are statistically different, except for the age for funds, which indicates that mutual funds belonging to private companies and public companies are different in characteristics including sizes, expense ratios, turnover ratios and size of the management team.

Chapter 4

Methodology

In this thesis, to investigate the relationship between organizational forms of fund management companies and mutual fund performances, a two-step analysis is provided

4.1 Fund Performance Evaluation

First, to analyze the performance of mutual funds, the study adopts the methodological approach to use the classic four-factor model which includes both the three risk factors from Fama-French (1993) and the momentum factor from Carhart (1997), combining with the quadratic market-timing factor from Treynor and Mazuy (1966).

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t} \quad (1)$$

Where $r_{i,t}$ is the excess return of portfolio *i* relative to risk-free rate in period *t*, $r_{m,t}$ is the market's excess return over risk-free rate in the same period *t*, $\beta_{i,m}$ represents the systematic risk of the market portfolio, $r_{SMB,t}$ (SMB stands for "small minus big") represents the size factor, which is measured by the excess return of small-cap stocks over big-cap stocks, $r_{HML,t}$ (HML stands for "high minus low") is the book-to-market factor, which is measured by the excess return of high book-to-market stocks over low book-to-market stocks, $r_{MOM,t}$ is the excess return of winner and loser portfolios in period *t*-1 and $\beta_{i,SMB}, \beta_{i,HML}, \beta_{i,MOM}$ are the corresponding risk exposures. $\varepsilon_{i,t}$ is the error term. There are 3 properties of the error term, E($\varepsilon_{i,t}$)=0, Var($\varepsilon_{i,t}$)=${\sigma^2}_{\varepsilon_{i,t}}$

and Cov($\varepsilon_{i,t}, r_{m,t}$)=0.

The estimation of the interception α_i is the measurement of fund performance, which is the abnormal return of the fund, adjusted for benchmarks (beta, SMH, HML, MOM and market-timing ability).

4.2 Multivariate Regression

4.2.1 Regression

To examine the correlation between mutual fund performance and the organizational form of management companies, multivariate regression is provided, similar to prior works to investigate the relation between fund performance and multiple dependent variables. The estimated risk-adjusted fund return is regressed on the public/private dummy variable, controlling for other fund characteristic variables that have been proven to have an impact on fund performance.

$$\alpha_{i,t} = \mathrm{c}_i + \gamma \mathrm{Dummy}_{i,t} + \delta X_{i.t} + \varepsilon_{i.t} \quad (2)$$

Where c_i is a constant, and $\mathrm{Dummy}_{i,t}$ is primary variable, which is the public dummy for fund *i* in time *t*. The value of $\mathrm{Dummy}_{i,t}$ is 1 when the fund management company or the ultimate parent company is publicly-listed and 0 otherwise. $X_{i.t}$ is a set of control variables in time t, which includes fund size, management company's total net asset value, number of funds managed by the company, expense ratios, turnover ratios, age of the fund, a team managed dummy, and investment objective

dummy. $\varepsilon_{i.t}$ is an error term that is not correlated with an independent variable.

4.2.2 Control Variables

The control variables added to the regression are designed to control for the fund and governance characteristics that have been demonstrated to be able to impact on mutual fund performance.

In this thesis, the size of the fund is measured by the logarithm of the total net asset of the fund. Management company size is measured by two proxies. One is the logarithm of the total assets managed by the company, the other is the total number of funds existing under the company's name during the sampling period. Fund age is measured by the number of years that a fund has in existence since its first offering to the end of the sampling period. The expense ratio is measured as a percentage of the total net asset of the fund.

[Please insert table 3 here]

Table 3 reports the correlation of the numerical control variable, which includes the total net assets of fund management company, number of funds managed by the management companies, total net assets of funds, turnover ratios, expense ratios and age of funds. The number of funds managed by companies is significantly positively correlated to the total net assets of companies, with a number of 0.63. It is consistent with expectation, that both the number of funds managed, and total net assets of management companies are measures of company size. None of the other variables has

a significantly strong linear correlation.

4.2.2.1 Fund Size and Management Company Size

To control for economies of scale, both fund size and the management company size are included as control variables. Prior studies on economies of scale in the mutual fund industry showed that fund size was a significant influencing factor on mutual fund performance (Berk & Green, 2004; Chen et al., 2004), and capital inflows of management companies, which was endogenously correlated to fund size, and were related to past performance (Chevalier & Ellison, 1997; Sirri & Tufano, 1998). Facing massive inflows into a fund with good performance in the past, the efficiency and liquidity of asset investments were decreased, and the situation was especially worse for large organizations. Managing a large number of assets requires much more skills compared to managing small funds. Chen et al. (2004) examined the performance of 3,439 funds from 1962 to 1999 by controlling the change in total net assets. They provided evidence that the size of funds was negatively correlated with past performance of the mutual fund at the fund level, and that funds managed by a larger fund family have a greater chance of outperforming.

4.2.2.2 Expense Ratio

An expense ratio is shown in a fund's prospectus. It includes the cost of promoting and marketing the fund, management fees, and administrative cost. Prior findings on the relationship between mutual fund fees and performance have been inconsistent.

Ippolito (1989) documented a positive correlation between management fees and mutual fund performance. However, Carhart (1997) found evidence for the opposite result, of which management fees were negatively related to the fund's performance.

4.2.2.3 Turnover Ratio

Turnover ratio is a measure of the activity of a fund. It stands for the frequency of a fund's trade. Fund turnover is directly related to trading costs and tax burden. However, some research documented a positive turnover and performance relation, indicating that profitable trades can offset trading frequency cost (Lakonishok, Shleifer & Vishny, 1992). Ding and Wermers (2012) argued that a higher turnover ratio indicated more private information or more potential for the manager to outperform.

4.2.2.4 Fund Age

Fund age refers to the number of years since the fund first launched considering all possible classes. Existing studies on the impact of the age of funds on their performance are mixed. There is evidence that shows a negative age-performance relation for mutual funds (Pástor, Stambaugh & Taylor, 2015). However, this result may have been due to the increase in the fund size during a fund's lift.

4.2.2.5 Team Management Dummy

While small funds can be managed by a single manager, large funds are usually managed by a management team. Group managers have access to more information and

resources, but face the risk of losing effectiveness. Chen et al. (2004) included a team management dummy in their research on economies of scale in mutual fund and organizational diseconomies with multiple managers associated with the eroding effect on mutual fund performance.

4.2.2.6 Fund Investment Style

CRSP reports fund investment style as Lipper Objective codes since 1998. I aggregate the codes into eleven commonly used categories, which are: Balanced, Growth, Income, Growth and Income, Alternative, Sector, Bond, International, Mid-cap, Small-cap[6], and Global. Prior studies documented that funds with some specific investment styles significantly outperform other funds (Chen and Huang, 2011) and is related to the difference in operating costs (Tufano and Sevick. 1997).

[6] Small-cap is defined as the reference group in my analysis. Thus, it is not reported in the table of results.

Chapter 5

Empirical Results

5.1 Performance Evaluation Results

This table presents the regression results of the performance evaluation of the mutual funds of all samples and the results categorized by organizational forms respectively. According to Panel A of Table 4, both public and private funds generate negative risk-adjusted returns on average. The negative performances are statistically significant for both public and private funds with t-value of -5.93 and -3.96 respectively, meaning that both forms of management companies fail to add value to their active fund management. Publicly listed management companies have a slightly lower alpha than private management companies of approximately 0.9%. Regarding the risk factors, according to the coefficients form the results, excess market returns are significantly positively related to fund returns, and SML, HML, momentum and market-timing factors are not related to fund returns as their coefficients are insignificant.

[Please insert table 4 here]

Panel B of Table 4 reports the distribution analysis of fund performance. The skewness for all funds is -7.2, thus the performance severely diverges to the negative side from its mean and median. The performance of private companies is more skewed, in which more diverged from their mean and median. The performance of public companies is not much skewed to the left of the mean and median compared to the

performance of funds of private companies. The performance distribution is very different for public and private management companies. With bigger kurtosis and smaller skewness, the performance of private companies has a higher peak and, smaller outline but is more skewed to negative numbers compared to the performance of public companies.

The results align to prior literature. Ferris and Yan (2009) documented statistically significant negative differences between the risk-adjusted performance of funds managed by publicly-traded management companies and privately-held companies using alphas generated by single factor CAPM model, Fama-French three-factor model, and Carhart's four-factor model. Berkowitz and Qiu (2009) detailed a similar result by comparing adjusted returns of funds under public and private companies through calculation with different asset pricing models.

5.2 Multivariate Regression Results

Table 5 represents the multivariate regression results on the differences in ownership structure affecting mutual fund performance. The results show that the coefficient of public dummy variables is negative and statistically significant. The coefficient is -0.97%, which means that compared with mutual funds under privately-held management companies, funds under public-traded companies underperform by 0.97% on average from the year 2007 to 2016. The performance differences between public-traded and privately-held companies are small, but the results indicate that risk-adjusted return of funds managed by public-traded management companies tend to

underperform, compared to those of privately-held companies, after controlling for fund age, expense ratio, turnover ratio, fund size, management company size, fund size, number of funds managed and investment styles. Ferris and Yan (2009) found a similar negative effect of publicly-traded organizational forms of management companies on mutual fund performance using a similar regression with objective-adjusted returns as the dependent variables, after controlling for fund characteristics. The coefficient of public dummy variable they got is significantly negative with both gross and net returns.

[Please insert table 5 here]

According to the results, the coefficient of fund size is statistically positive. As such, there is a positive relationship between fund size and mutual fund performance. Large funds should have a better chance to outperform small funds. This negative relation between fund size and performance is inconsistent with what Berk and Green (2004) found, which was that there was a negative correlation between fund size and fund performance. However, other studies have found a positive correlation between fund size and fund performance, especially for small, illiquid funds (Yan, 2008).

Fund family size has an opposite impact on performance compared to fund size, where the coefficient is significantly negative for the total net assets of management companies. The fact that management company size is negatively related to performance indicates that mutual funds under the management of large companies are likely to underperform compared to those under small companies. The result that the effects of fund size and fund family size are opposite on mutual fund performance and

consistent to the empirical results concluded by Berk and Green (2004) and Ferris and Yan (2009).

However, unlike the total net asset of fund management companies, as another measure of fund family size, the number of funds managed by the company has a significantly small positive coefficient. In Bessler et al.'s (2016) empirical study of winner fund performance, they found smaller winner funds performed significantly better than larger winner funds. Furthermore, with regards to the family level of funds, the family's total net asset and the number of funds managed has a conflict of effects. As such, the results without conditions on fund size and fund family size are not conclusive.

Moreover, in regard to other control variables, the expense ratio is negatively related to mutual fund performance and the relationship is statistically significant. Unexpectedly, turnover ratio and team management dummy are unrelated to mutual fund performance as their coefficients are insignificant. Regarding investment style of funds, six out of ten investment styles have significant coefficients. The results indicate that alternative funds, growth and income funds, income funds and sector funds have better performance compared to small-cap funds. Meanwhile, balanced funds and bond funds have poorer performance compared to small-cap funds.

5.3 Robustness Check

In this section, I have provided regression results with risk-adjusted performance generated from different asset pricing models. By comparing the regression results of

different risk-adjusted performance to what I got before, I am able to check if the negative effect of the ownership structure of management companies on their mutual fund performance persists.

In this test, I employ five different asset pricing models to measure risk-adjusted mutual fund performance.

Fama-French Three-factor Model:

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + + \varepsilon_{i,t} \quad (3)$$

Carhart Four-Factor Model:

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \varepsilon_{i,t} \quad (4)$$

Pastor-Stambaugh Five-factor Model

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \beta_{i,CMA} r_{CMA,t} + \varepsilon_{i,t} \quad (5)$$

Fama-French Three-factor with market-timing factor

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t} \quad (6)$$

Pastor-Stambaugh five-factor with market-timing factor

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \beta_{i,CMA} r_{CMA,t} + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t} \quad (7)$$

Where $r_{CMA,t}$ is measured by the difference between returns of portfolios that invest conservatively and aggressively.

[Please insert table 6 here]

Table 6 presents the average risk-adjusted performance of publicly-traded and privately-held management companies with different asset pricing models respectively. It also reports the mean difference of performance between the two forms of companies and the significance of the difference.

According to Table 6, mutual funds managed by both public and private management companies are generating negative alphas in all cases, which indicates that the actively managed funds failed to predict the market. Furthermore, funds of public companies underperformed compared to those of private companies as they generate smaller alphas with different benchmarks. As such, differences of risk-adjusted performance between funds of public and private companies are statistically significant.

Table 7 represents the multivariate regression with risk-adjusted performance generated from different asset pricing models. Fama-French three-factor model, Carhart's 4 factors model, five-factor model, and three- and five-factor model, in addition, to taking market-timing factor into account, are the models used in this section.

[Please insert table 7 here]

The signs of the coefficient of the public dummy variables generated with risk-

adjusted performance generated with different asset pricing models are all negative and consistent with my previous results. The negative signs developed in the five tests indicate that under different asset pricing models, the negative impact of publicly-traded companies on mutual fund performance is consistent. The signs of coefficients of other control variables are mostly consistent with the exception of turnover ratio. However, turnover ratio is an insignificant variable in this study.

Overall, the results support the hypothesis that the performance of funds managed by publicly-traded companies is poorer compared to the performance of funds managed by privately-held mutual funds management companies. Furthermore, these results indicate that mutual fund performance is negatively affected by the public organizational form of a mutual fund management company.

I include both the fund company size and the number of funds managed by a company as control variables in the cross-section regression. These two variables are both proxies of mutual fund management company size, thus, are highly correlated. Usually, large management companies with more assets under management have more funds under control. To test if the correlation variables cause any biased or misleading results, I compare the estimation results of 4 regressions. in the first regression, I regress risk-adjusted returns on public dummies and control variables the same as what I use in the cross-section regression with the exception of investment style dummies. The two correlated company size proxies are both included in this regress. In the second regression, I remove the total net asset of management companies from independent variables. In the third regression, I remove the number of funds managed by fund

management companies from the independent variables. In the fourth regression, I remove neither the total net asset of management companies or the number of funds managed by fund management companies from the independent variables.

[Please insert table 8 here]

In table 8, I present the regression results from the 4 regressions with different combinations of company size proxies, which are the total net assets of fund management companies and the number of funds managed by companies. The results show the number of funds managed by companies is insignificant. The coefficient of the total net asset of fund management companies is negative and significant at 10% level. The results are consistent with my prior results and have minor differences on coefficients but no difference in the significance. Moreover, the explained power has minor change that is smaller than 1% in all cases. Thus, no evidence shows that the correlation variables cause problems in the regression results.

5.4 Discontinuous Returns

There is a discontinuity problem with the returns of mutual fund data since I had kept all funds in existence in the sample period. Some of the funds delisted in the sample period, some of the funds started after the start date of my sample period, and, some of the funds became inactive but re-entered the market after a period of time. Discontinuity causes the sample funds to have different observation numbers of returns. Furthermore, returns of some funds may be discontinuous, in which case, the regression results of risk-adjusted returns may also be biased.

To test if the discontinuity problem of returns affects the results I present before, I conduct an additional test. First, I separate the sample companies into two categories, publicly-traded and privately-held. Next, I take the monthly mean returns for public and private funds respectively and use them to generate the risk-adjusted performance of public and private companies separately with different asset pricing models. As a result, I am able to compare the differences in mutual fund performance of the two forms of companies. The results are presented in Table 9.

[Please insert table 9 here]

I find that both funds managed by public and private management companies are generating negative risk-adjusted returns on average with different asset pricing models from 2007 to 2016. However, the performance of funds managed by publicly-traded management companies is poorer than that of privately-held management companies. The results are consistent with the results I present in section 5.1.

5.5 Endogeneity

Based on what Demsetz (1983) and Demsetz and Lehn (1985) argued in their literature, the ownership structure of a company was an endogenous variable. The ownership structure of a companies was determined by the trade-off between cost advantages and disadvantages, and some of the characteristics that affect the value of the firm also work on shaping the ownership structure of the firm. Any empirical study using OLS analysis method with endogenous variables suffered from the endogeneity

issue, which may have lead to biased regression results.

To address the endogeneity issue in this research, I conduct a difference-in-differences analysis to examine the differences between the change of performances of funds under public companies before and after their IPO and the change of performance of their Propensity Score matching funds under private companies before and after the same date. The IPO date data is available for 144 of 156 public companies in the sample, and 1057 funds are managed by those companies. The period covers by the analysis is from 1961.12, which is the earliest returns data available on CRSP, to 2016.12.

Each of the funds under the management of a public company is paired against a fund with similar characteristics under the management of a private company. The greedy algorithm with a propensity score matching method is used to find the most closed fund.

The propensity score is between 0 and 1, which is the predicted probabilities of a company to be publicly-traded or privately-held. A logistic regression of whether a company is publicly-traded or privately-held depends on characteristic variables creates the score. The dependent variable is a binary variable of public dummy, which is equal to 1 if the management company or the parent company of it trades publicly, otherwise equal to 0. It is regressed on variables that potentially affect the organizational form of a management company, including family total net asset, number of funds managed by the company, time-series mean returns, fund performance, age, total net asset of fund, expense ratio, turnover ratio, whether the fund is managed by single or team managers,

and estimated betas[7]. The score represents the relation between the determined characteristics[8] and the organizational structure of the company. A fund under a public company will be matched to a fund of a private company with the nearest distance measured by propensity score. The two funds are not taken into account in the next matching calculations. This matching method is done without replacement, which is also known as the Greedy Match. Through this matching process, all funds managed by public companies are paired with the most similar funds managed by private companies. In case the distance between paired scores is large, meaning the paired funds are not similar to each other and may lead to a misleading comparison outcome, the largest distance allowed while matching is equal to 0.1. Failure of matching for some funds will happen under this condition. After matching the funds, I compared the relative change of performance after and before the IPO date for funds of public companies and the propensity score matched funds of private companies.

[Please insert table 10 here]

Table 10 represents the logistic regression results used to create propensity scores and demonstrate how well the model works. Panel A of the Table shows the independent variables and coefficient of the logistic model of whether or not a company is a public-traded or privately-held based on including independent variables. Fund family total net asset and the number of funds managed are significant determinants of

[7] Performance and betas used are results from regression of equation 1, which is Carhart's four-factor model with market-timing factor.

[8] Dependent variables are control variable used in cross-section regression plus performance and betas. Which performance and beta added are determined by the ones that give the highest Pseudo R-square to the logistic regression.

a company's organizational form. The relationship between organizational form of management companies and the size of management companies is economically significant since a publicly-traded management company usually grows from a small private company with one or two funds and little assets under management. Once the small private company perform well on their funds, the company starts attract money inflows and becomes larger in size, the launch its IPO or been merge by a larger management company. Thus the company size can be a crucial determinant of a company's organizational form. The fund's total net asset has an insignificant coefficient. This is economically significant since mutual funds management companies usually manage more than one fund. The organizational structure of a company should be related to the company's size rather than the size of one fund under management. Performance is also significantly related to the organizational forms of a management company, however, in a negative direction, which indicating once a management company transfers from a private company to a public company, the performance of its funds is poorer compared to that of private companies, probably due to losing original management team or losing ambitious to perform after absorbing enough money inflows. Average returns, the age of fund, whether a fund is managed by a single or team managers, are characteristics unrelated to the organizational form of a fund management company. However, the beta of momentum, market-timing factors, expense ratio and turnover ratio of a fund are significantly related to the organizational form of management companies.

Panel B shows the comparison of means and the significance of the difference of

means for the 2 groups of matched funds. The differences between means of most independent variables are small and insignificant, including average returns, expense ratio, turnover ratio, whether a fund is single or team managed, and betas. Only risk-adjusted performance variables for funds of public companies and matching funds of private companies have a significant difference in mean. The total net assets of the fund family, number of funds managed, age of fund and fund total net asset do not have significant difference mean compared to their paired funds, due to high number digit. Thus, the two sets of funds match each other.

[Please insert table 11 here]

Table 11 presents the relative change in performance before and after the IPO date for funds of public companies and the Propensity Score matched funds of private companies. The sample contains 97 pairs of funds and risk-adjusted performance measured with Carhart's four-factor model with the market-timing factor, based on returns data from 12.1961 to 12.2016, which collected from CRSP Survivor Bias-free Mutual Fund Database. The number of matched pairs drops dramatically to 97 as a result of missing data on returns either before or after the IPO date, and funds with 12 or fewer observations of returns have been removed from the sample as well.

For funds managed by public management companies, the average risk-adjusted performance is 0.10% before the companies go to public. After management companies launch their stock on the market, the average risk-adjusted performance is -0.09%. The difference in performance of funds managed by public companies is -0.20%, which

indicated that after management companies went public, the performance worsened in general. The reduction in mean performance of public funds after and before IPO date is statistically significant. To avoid any bias caused by unequal observations of returns for different funds before and after IPO date, I also test the significance of the difference in weighted average. The results are consistent, in that there is a significant decline in fund performance after management companies launched their stock into the market. The matched funds of private companies have a mean risk-adjust return of 0.01% before the IPO date for the public companies who managed their matched fund, and a mean risk-adjust return of -0.12% after. There is a difference in performance of matched funds of private companies of -0.12%. The decrease in matched funds is statistically significant as well. Comparing the negative change in performance of funds managed by public companies, which is -0.20%, and the negative change in performance of matched funds managed by private companies, which is -0.12%, the change in performance for funds managed by public companies is worse than the change in performance for funds managed by private companies by -0.07%.

The results from a comparison of changed with the propensity score matched sample are similar to the results from the multivariate method. The results also support that the hypothesis that publicly-traded management companies have a negative impact on mutual fund performance.

Chapter 7

Conclusion

This thesis examines how the organizational form of mutual fund management companies impacts mutual fund performance. The thesis contributes to the existing literature on this topic by answering the research question with a less biased asset pricing model, which takes market-timing factors into account, and compares the results to those with ordinary asset pricing models. Similar to previous literature, the results show that the performance of mutual funds managed by publicly-traded management companies is lower than those managed by privately-held companies. The negative effect is modest but significant. It has also concluded that the negative impact of mutual fund performance from public companies is robust with risk-adjusted returns generated from different asset pricing models.

The thesis also addresses the discontinuity issue for the returns collected from CRSP and the endogeneity issue for organizational structure variables which may cause the research results to be biased. To examine if the discontinuity issue affected the research results, a test is done to compare the average performances between publicly-traded and privately-held companies by taking the mean returns for each time period. The test results also indicate that the negative effect on mutual fund performances from public management companies is consistent.

Furthermore, since organizational forms of a company is an endogenous variable, the thesis involves conducting a difference-in-differences analysis on performances

after and before IPO date for a subsample, which is created by Propensity Score Matching. The analysis is performed to determine whether the negative effect of mutual fund performance from public companies is consistent compared with the change of performance for matched funds managed by private companies in the same time period under same market conditions. The results of the test show that after management companies when public, the average fund performance worsen compared to their matched funds managed by private companies in the same time period.

In summary, this study provides evidence that the organizational structure of management companies as an influencing factor on mutual fund performance and the correlation between the organizational structure and mutual fund performance is significant and consistent. Therefore, the research results from this thesis support the findings of Berkowitz and Qiu (2001) and Ferris and Yan (2008), in which mutual funds managed by publicly-traded management companies significantly underperform compared to funds of managed by privately-held companies

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Tables

Table 1

Summary Statistics (Sample Fund Management Companies)

Variables	Public	Private	All Companies
Number of Companies	156	626	782
Overall Total Net Asset($ million)	223438.66	196511.80	419950.46
Average Total Net Asset($ million)	1432.30	313.92	537.02
Number of Funds managed	152.23	24.35	49.86

This table presents the summary statistics for all fund management companies in the research during a 10-year period, from 2007-2016. The data contains 782 fund management companies that has showed anytime during the 10 years on the CRSP Survivor-bias free mutual fund dataset. Company's Total Net Asset is the sum of TNAs of all funds belonging to the fund management company at year-end without adjusted to inflation. Average total net asset is the time-series means of the total net asset in the time period. Number of Funds managed for each company is the sum of all funds that ever exists under the fund management company's name during the sampling period.

Table 2

Summary Statistics (Sample Funds)

Variables	All Funds	Public	Private	Mean Difference (Public-private)
Number of Funds	4200	1970	2230	
TNA($ million)	625.34	425.23	802.31	-345.20***
Fund Age	12.96	12.99	13.02	-0.28
Expense Ratio	0.01	0.01	0.01	0. 18%***
Turnover Ratio	1.01	0.83	1.36	-0.52**
Team Managed	3137	1495	1639	-0.06***

This table represents summary statistics of control variables, categorized by the organizational form of the fund management company for each fund. The sample contains 4,200 active managed funds that managed by sample fund management companies between 2007 and 2016, from CRSP Survivor-bias free mutual fund database. Total net assets, Expense ratios and Turnover ratios are time-series means of these fund characteristics during the sample period. Fund age of each fund is calculated as the time between the first offer date and the last reported date in years. Regarding team management dummy, a fund is classified as single managed if there is one manager name reported from CRSP. A fund is classified as team managed if there is more than one manager name or team managed reported from CRSP. Mean difference and significance are also reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 3

Sample Correlation of Numerical Control Variables

Variable	TNA funds	TNA Company	Turnover Ratio	Expense Ratio	Number of Funds managed	Age of funds
TNA Funds	1					
TNA Company	0.26***	1				
Turnover Ratio	-0.02	-0.02	1			
Expense Ratio	-0.13***	-0.21***	0.10***	1		
Number of Funds managed	0.15***	0.63***	-0.04	-0.28***	1	
Age of Funds	0.29***	0.12***	-0.05	-0.00	0.11***	1

This table provides sample correlation of numerical control variables for a sample of 782 mutual fund management companies and 4200 funds from 2007 to 2016. Data collects from CRSP Survivor Bias-Free Mutual Fund Database. Total net assets of funds (TNA funds), Expense ratios and Turnover ratios are time-series means of these fund characteristics during the sample period. Company's Total Net Asset (TNA company) is the sum of TNAs of all funds belonging to the fund management company at year-end without adjusted to inflation. Number of Funds managed for each company is the sum of all funds that ever exists under the fund management company's name during the sampling period. Fund age of each fund is calculated as the time between the first offer date and the last reported date in years. *** indicates the number is significant at the 1% level.

Table 4 Performance Regression Results and Distribution Analysis

Panel A. Performance Regression Results			
	All Funds	Public	Private
Intercept (α)	4.88%(-4.86)	-5.38%(-5.93)	-4.45%(-3.96)
MKT	1.03%(7.09)	1.05%(7.12)	1.02%(7.07)
SML	0.12%(0.24)	0.20%(0.14)	0.04%(0.31)
HML	0.00%(-0.68)	-0.06%(-0.91)	0.06%(-0.48)
MOM	-0.21%(-0.70)	-0.28%(-0.86)	-0.16%(-0.57)
Market-timing	0.03%(0.84)	0.03%(1.19)	0.02%(0.54)
adjusted R-square	0.75		
Panel B. α Distribution Analysis			
	All Funds	Public	Private
Mean	-4.88%	-4.45%	-5.38%
Median	-5.90%	-4.98%	-6.06%
Standard Deviation	5.76%	6.12%	5.26%
Kurtosis	173.32	247.90	11.64
Skewness	-7.18	-9.82	-2.38
Count	4144	1929	2215
Mean Difference	-0.93%***		

This table presents the performance estimation of the sample mutual funds both in all and categorized by organizational forms. There are 4,144 funds with observations from 8 to 120 months. (Observation number changed due to removed results for funds with too less returns observations) Panel A is the performance regression results. The regress equation is $r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t}$ $r_{m,t}$ is the market's excess return over risk-free rate in the same period *t*, SMB represents the size factor, which is measured by the excess return of small-cap stocks over big-cap stocks, $r_{HML,t}$ is the book-to-market factor, which is measured by the excess return of high book-to-market stocks over low book-to-market stocks, $r_{MOM,t}$ is the excess return of winner and loser portfolios in period *t*-1. Data of Returns, risk-free rate, $r_{m,t}$, $r_{SMB,t}$, $r_{HML,t}$ and $r_{MOM,t}$ are collected from CRSP Survivor Bias-Free Mutual Fund Database. $r_{i,t}$ is calculated as monthly returns minus risk-free

rate for each fund. The intercept is the measurement of the risk-adjusted return. Panel B is the distribution analysis of performance estimations. *** indicates the number is significant at the 1% level.

Table 5

Multivariate Regression Results

	Estimate	Standard Error	t Value
Intercept	-1.91%***	0.42%	-4.57
Public Dummy	-0.98%***	0.14%	-6.75
Age of Fund	-0.13%***	0.01%	-18.37
Team Managers	0.13%	0.16%	0.82
Expense Ratio	-103.55%***	13.33%	-7.77
Turnover Ratio	-0.01%	0.01%	-0.46
Number of Funds (family)	0.00%	0.00%	0.79
lg(TNAfund)	0.12%***	0.03%	3.62
lg(TNAfamily)	-0.11%***	0.04%	-2.55
Investment Style			
(Balanced)	-3.78%***	1.43%	-2.64
(Alternative)	3.01%***	0.32%	9.43
(Bond)	-2.02%**	0.91%	-2.22
(Global)	1.15%	3.01%	0.38
(Growth and Income)	0.89%***	0.25%	3.56
(Growth)	0.08%	0.22%	0.34
(Income)	2.01%***	0.30%	6.62
(International)	0.24%	0.50%	0.48
(Mid-cap)	-0.29%	0.30%	-0.97
(Sector)	0.79%***	0.30%	2.64
observations	3922		
Adjusted R-square	0.18		

This table represents the multivariate regression results with 3922 mutual funds managed by 782 companies between 2007 and 2016. (Observation number changed due to missing values) Data is mainly from CRSP Survivor Bias-Free Mutual Fund Database, and the data of organizational forms of companies is manually collected from Bloomberg Terminal. The dependent variable, which is risk-adjusted returns generated by the combination model of Carhart's four factors and market-time factor, is regressed on public company dummy and control variables (age of fund, team management dummy, expense ratio, turnover ratio, number of funds managed, fund TNA, company TNA and investment style dummy). *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 6

Risk-adjusted Performance of Funds with Different Benchmarks			
	Public	Private	Mean Difference
FF3 model	-4.82%	-4.04%	-0.79%***
FF4 model	-4.77%	-4.05%	-0.72%***
FF5 model	-4.87%	-4.14%	-0.73%***
FF3&Market-timing	-5.44%	-4.47%	-0.97%***
FF5&Market-timing	-5.39%	-4.51%	-0.88%***

This table presents the average performance evaluation of the sample mutual funds by organizational forms generating by different asset pricing models, which includes three-factor model, four-factor model, five factor model and three and five factors in addition with market-timing factor. It is also reported the mean difference between public and private companies. The sample contains 4,200 funds with observations from 8 to 120 months. Data of Returns, risk-free rate, $r_{m,t}$, $r_{SMB,t}$, $r_{HML,t}$, $r_{MOM,t}$ and $r_{CMA,t}$ are collected from CRSP Survivor Bias-Free Mutual Fund Database. $r_{i,t}$ is calculated as monthly returns minus risk-free rate for each fund. The intercept is the measurement of the risk-adjusted return. *** indicates the number is significant at the 1% level.

Fama-French Three-factor Model (FF3 model):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + +\varepsilon_{i,t}$$

Carhart Four-Factor Model (FF4 model):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \varepsilon_{i,t}$$

Pastor-Stambaugh Five-factor Model (FF5 model):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} +$$

$$\beta_{i,CMA} r_{CMA,t} + \varepsilon_{i,t}$$

Fama-French Three-factor with market-timing factor (FF3&Market-timing):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t}$$

Pastor-Stambaugh five-factor with market-timing factor (FF5&Market-timing):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} +$$

$$\beta_{i,CMA} r_{CMA,t} + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t}$$

Table 7

Multivariate Regression Results with Risk-adjusted Performance Generated with Different Asset Pricing Models					
	FF3 model	FF4 model	FF5 model	FF3&Market-timing	FF5&Market-timing
Intercept	-1.83%***	-1.89%***	-1.87%***	-1.93%***	-1.99%***
Public Dummy	-0.79%***	-0.80%***	-0.82%***	-0.96%***	-0.97%***
Age of Fund	-0.11%***	-0.11%***	-0.11%***	-0.13%***	-0.12%***
Team Managers	0.10%	0.09%	0.09%	0.14%	0.12%
Expense Ratio	-86.72%***	-84.87%***	-87.47%***	-105.92%***	-103.01%***
Turnover Ratio	0.00%	0.00%	0.00%	-0.01%	-0.01%
N of Funds (Family)	0.00%	0.00%	0.00%	0.00%	0.00%
lg(TNAfund)	0.08%***	0.09%***	0.09%***	0.11%***	0.12%***
lg(TNAfamily)	-0.09%***	-0.08%***	-0.09%***	-0.11%***	-0.11%**
Investment Style					
(Balanced)	-3.40%**	-3.77%**	-3.83%*	-3.63%***	-3.78%*
(Alternative)	2.57%***	2.57%***	2.62%***	3.07%***	3.05%***
(Bond)	-1.78%	-1.75%*	-1.71%***	-1.94%**	-1.90%**
(Global)	0.48%	0.77%	0.92%	1.04%	1.27%
(Growth and Income)	0.82%***	0.80%***	0.81%***	0.97%**	0.94%***
(Growth)	0.13%	0.13%	0.13%	0.13%	0.12%
(Income)	1.80%***	1.78%***	1.81%***	2.09%***	2.07%***
(International)	0.02%	0.07%	0.09%	0.28%	0.29%
(Mid-cap)	-0.20%	-0.18%	-0.19%	-0.25%	-0.25%
(Sector)	0.60%*	0.59%*	0.63%**	0.86%**	0.85%***
Number of Obs	3922	3922	3922	3922	3922
adjusted R-square	0.19	0.18	0.18	0.18	0.17

This table represents the multivariate regression results with risk-adjusted performances generated with different asset pricing models. The dependent variable is risk-adjusted return generated from models of Fama-French three-factor model, four-factor model, and three and five factors model together with market-timing factor respectively. Different risk-adjusted returns are regressed on public company dummy and control variables (age of fund, team management dummy, expense ratio, turnover ratio, number of funds managed, fund TNA, company TNA and investment style dummy). Data is from

CRSP Survivor-Bias Free Mutual Fund Database and Bloomberg Terminal. All independent variables are the same as Table 4. Number of observations is smaller than sample due to missing data. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 8

Effects of Number of Funds managed and Fund Family Size proxies				
	(1)	(2)	(3)	(4)
Intercept	-1.41%***	-2.11%***	-1.59%***	-2.16%***
	(0.00)	(0.00)	(0.00)	(0.00)
Public Dummy	-1.01%***	-1.05%***	-0.98%***	-1.08%***
	(0.00)	(0.00)	(0.00)	(0.00)
Age of Fund	-0.14%***	-0.14%***	-0.14%***	-0.14%***
	(0.00)	(0.00)	(0.00)	(0.00)
Team Managers	0.21%	0.20%	0.19%	0.20%
	(0.20)	(0.23)	(0.24)	(0.21)
Expense Ratio	-83.74%***	-74.11%***	-83.09%***	-72.38%***
	(0.00)	(0.00)	(0.00)	(0.00)
Turnover Ratio	0.01%	0.01%	0.01%	0.01%
	(0.47)	(0.36)	(0.43)	(0.36)
Number of Funds (family)	0.00%	0.00%		
	(0.15)	(0.51)		
lg(TNAfund)	0.13%***	0.10%***	0.12%***	0.10%***
	(0.00)	(0.00)	(0.00)	(0.00)
lg(TNAfamily)	-0.12%*		-0.08%*	
	(0.01)		(0.01)	
observations	3922			
Adjusted R-square	0.14	0.13	0.14	0.14

the table represents the effects of regression results when bring both family total net assets, number of funds managed by companies into the regression. The sample contains 3922 mutual funds managed by 782 companies between 2007 and 2016. Data is collected from CRSP Survivor Bias-Free Mutual Fund Database and Bloomberg Terminal. Regression (1) is risk-adjusted returns, which generated by the combination model of Carhart's four factors and market-time factor, regressed on public company dummy, age of fund, team management dummy, expense ratio, turnover ratio, number of funds managed, fund TNA and company TNA. (2) is same regression but without company TNA variables. (3) is same regression but without number of funds managed variables. (4) is same regression but without either company TNA nor number of funds managed variables. The number under coefficients in () are the p-values. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 9

Discontinuity Test

Model	Public alpha	Private alpha	Public-Private
FF3 factors	-6.38%	-6.26%	-0.13%
FF3+market-timing factors	-5.77%	-5.67%	-0.10%
FF4 factors	-6.51%	-6.37%	-0.13%
FF4+market-timing factors	-5.90%	-5.79%	-0.11%
FF5 factors	-6.37%	-6.25%	-0.13%
FF5+market-timing factors	-5.88%	-5.77%	-0.11%

This table represents the mean risk-adjusted return for public and private companies, with the sample of 4144 mutual funds belonging to 782 management companies. Monthly return of mutual fund and risk factors data is from CRSP Survivor-Bias Free Mutual Fund Database. Average monthly returns for public and private companies is the dependent variable. Risk-adjusted returns are generated for public and private companies by using Fama-French 3 factors, 4 factors, 5 factors and these models with market-timing factors are presented respectively.

Fama-French Three-factor Model (FF3 model):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + + \varepsilon_{i,t}$$

Carhart Four-Factor Model (FF4 model):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \varepsilon_{i,t}$$

Pastor-Stambaugh Five-factor Model (FF5 model):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \beta_{i,CMA} r_{CMA,t} + \varepsilon_{i,t}$$

Fama-French Three-factor with market-timing factor (FF3&Market-timing):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t}$$

Carhart Four-Factor with market-timing factor (FF4&Market-timing):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} \quad + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t}$$

Pastor-Stambaugh five-factor with market-timing factor (FF5&Market-timing):

$$r_{i,t} = \alpha_i + \beta_{i,m} r_{m,t} + \beta_{i,SMB} r_{SMB,t} + \beta_{i,HML} r_{HML,t} + \beta_{i,MOM} r_{MOM,t} + \beta_{i,CMA} r_{CMA,t} + \gamma_i {r_{m,t}}^2 + \varepsilon_{i,t}$$

Public-Private is the difference between public mean risk-adjusted returns and private mean risk-adjusted returns.

Table 10

Propensity Score Matching			
Panel A. Logistic Regression for Propensity Score			
Parameter		Coefficient	P-value
Family TNA		0.00***	0.00
Number of Funds (Family)		0.00***	0.00
performance (from eq 1)		-1.08*	0.10
average returns		-3.83	0.66
Age of Fund		0.00	0.40
Fund TNA		0.00	0.80
Expense Ratio		-35.47***	0.00
Turnover Ratio		-0.08**	0.01
Single or Team managed		-0.04	0.66
beta (market)		13.27	0.16
beta (SMB)		10.08	0.22
beta (HML)		-17.53	0.12
beta (MOM)		16.09*	0.07
beta(Market-timing)		273.40**	0.01
Number of Obs	3922		
Pseudo R-Square	0.29		
Panel B. Characteristics Comparison for Matched Sample			
	Public mean	Private mean	Diff mean P-value
Family TNA	17335.10	13848.70	3486.40
Number of Funds (Family)	242.60	247.30	4.71
performance (from eq 1)	-4.69%	-5.00%	-0.30%
average returns	0.55%	0.52%	-0.03%
Age of Fund	14.00	14.68	0.69
Fund TNA	579.10	647.10	67.96
Expense Ratio	1.15%	1.17%	0.01%
Turnover Ratio	0.98	1.08	0.10
Single or Team managed	0.75	0.78	0.03
beta (market)	1.08%	1.04%	-0.04%
beta (SMB)	0.21%	0.29%	0.08%
beta (HML)	-0.05%	-0.05%	0.00%
beta (MOM)	-0.27%	-0.20%	0.08%
beta(Market-timing)	0.03%	0.03%	0.00%

This table present the logistic regression results used to create propensity scores and how well the model works. Panel A of the Table shows independent variables and coefficient of the logistic model of whether or not a company is a public-traded or privately-held based on including independent variables. A set of funds of public companies and a matched set of funds of private companies are created using the Propensity Score from the logistic model. Panel B shows the comparison of means and the significance of the difference of means for the 2 group of funds. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 11

Comparison of Performance Change After and Before IPO Date with Propensity Score Matched Group of Public and Private Funds

	Public			
	after IPO	before IPO	A-B	Diff. Mean Significant (p)
Mean	-0.09%	0.10%	-0.20%***	0.00
Median	-0.08%	-0.01%	-0.07%**	0.66%
Weighted Mean	-0.04%	0.08%	-0.12%***	0.00
	Private			
	after IPO	before IPO	A-B	Diff. Mean Significant (p)
Mean	-0.12%	0.01%	-0.12%*	3.19%
Median	-0.10%	-0.01%	-0.09%***	0.06%
Weighted Mean	-0.09%	-0.02%	-0.07%*	2.44%
Relative changes of After-Before performance (Public-Private)				
Mean	-0.07%			
P-value	0.31			

This Table presents relative change in performance after and before IPO date for funds of public companies and Propensity Score matched funds of private companies in mean, median and weighted mean respectively. The sample contains 97 pairs of funds and performance measured based on returns data from 12.1961 to 12.2016, which collected from CRSP Survivor Bias-free Mutual Fund Database. Number of matched pairs drop dramatically due to missing data of returns either before or after IPO date, and funds with 12 or less observations have been removed from sample. A-B indicates the differences between risk-adjusted return after IPO and before IPO. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.