

**Does Fund Size Erode Performance?
Organizational Diseconomies and Active Money Management**

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Abstract: Various theories of organizations predict that small organizations outperform large ones. We test the hypothesis that fund size erodes mutual fund performance because of such organizational diseconomies. We find that fund performance indeed declines with fund size, even after adjusting performance by various benchmarks and controlling for other fund characteristics such as turnover and age. Consistent with our hypothesis, the effect of size on performance is most pronounced among funds that play small cap stocks, a fund style that requires many managers to operate effectively with asset base growth. And especially among these small cap funds, small funds outperform large ones at investing in local companies, suggesting that the diseconomies are due to small funds being better at processing soft information. Our findings have normative implications for the organization of active money management and are relevant for issues surrounding the boundaries of the firm.

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I. Introduction

In this paper, we investigate whether fund size erodes performance among active mutual funds. While this issue is an important one for the money management industry, they seem to be somewhat confused about the effects of fund size on fund returns. On the one hand, some practitioners observe that a fund with a big asset base typically has plenty of resources for research. And since the fixed costs of managing a fund is spread over more investors, big funds also have low expense ratios. So size need not obviously erode performance (see Fredman and Wiles (1998)).

On the other hand, many practitioners argue that despite these advantages of size, a large asset base does eat away at fund returns because of liquidity. Since big funds have to take larger positions per stock than is optimal, it is harder for them to get in and out of stocks than small funds. Also because of such liquidity considerations, a large fund may have to invest in its not-so-good ideas or in large cap stocks, whereas a small fund can easily put all of its money in its best ideas (see, e.g., Lowenstein (1997)). As a result, size becomes a drag on performance.

There has been little research on this issue. The little research that has been done is somewhat mixed. Grinblatt and Titman (1989) find evidence that gross fund returns (constructed only from fund stock holdings) decline with fund size, but do not find a similar effect using net fund returns.¹ Other studies use simulations to more definitively show that price impact erodes performance (see, e.g., Perold and Solomon (1991), Becker and Vaughn (2001)). These simulation studies assume---just as practitioners do---that bigger funds have to take larger positions in the same set of stocks.

¹ Morningstar often release research reports that find that fund size indeed erodes performance, even measured on a net fund return basis (for these reports, see Morningstar.com). These reports also offer investors tips on which small mutual funds to buy.

The point of departure for our paper is the following question: why should we take for granted that bigger funds naturally have to take larger positions per stock or have to invest in large cap stocks or not-so-good ideas? Presumably, as a small fund grows with good past performance, it can afford to hire more managers so as to cover more stocks. The fund can thereby generate additional good ideas so that it can take small positions in lots of stocks as opposed to large positions in a few stocks. Indeed, the vast majority of small cap stocks are untouched by mutual funds (see, e.g., Hong, Lim and Stein (2000), Chen, Hong, and Stein (2002)). So there is clearly scope for even very large funds to generate new ideas.

In other words, liquidity means that big funds need to find more stock ideas than small ones but liquidity itself does not explain why they cannot go about doing this, i.e. why they cannot scale. Put another way, why cannot two small funds merge into one large fund and still have the performance of the large one be equal to the sum of the two small ones?

We hypothesize that fund size erodes performance because of organizational diseconomies. To make things concrete, imagine that there is a new small fund company with one fund operated by one manager (also the founder) who picks the stocks. Since the fund is small, the founder along with a couple of analysts can easily invest the assets under management by generating a few stock ideas. But as the fund expands dramatically with past performance, the founder no longer has the capacity to invest all the money, so he needs to hire more managers and analysts to help him manage the fund. The stock picks now need to be coordinated among many more agents and therefore organizational form (e.g. flat versus hierarchical forms) becomes important. As such, organizational diseconomies may arise.

There are many types of organizational diseconomies. One set of diseconomies, from the work of Williamson (1975, 1988), includes bureaucracy and related coordination costs. Another set of diseconomies comes from the influence-cost literature (Milgrom (1988), Milgrom and Roberts (1988)). Yet another set of diseconomies centers on the adverse effects

of hierarchies (or authority) for the incentives of agents who do not have any control over asset-allocation decisions (see, e.g., Aghion and Tirole (1997), Stein (2002)).²

Organizational diseconomies related to the costs of hierarchies may be especially relevant for mutual funds. More concretely, if the founder in our example above undercuts the decisions of the newly hired managers, then they may not put as much effort into their research. As a result, the newly hired managers' efforts to uncover information or new ideas in this setting are diminished relative to a situation in which they manage their own smaller funds. So all else equal, large funds perform worse than small ones.

There are many other types of organizational diseconomies arising not only from the economics literature but also from the social psychology and organizational behavior literatures as well.³ These theories all predict in different ways that large funds ought to perform worse than small ones. Importantly, some of these theories offer other auxiliary implications that we will try to test.

Moreover, such diseconomies are likely to be important in practice. For these diseconomies to matter, mutual fund managers have to have some managerial ability to begin with. Mutual fund investors also have to be naïve in not understanding that there are disadvantages of scale. Otherwise, there would be nothing to scale or investors would rationally avoid large funds.

Indeed, existing research indicates that these two suppositions are likely to be true. Fund managers apparently have some ability to beat the market before fees (Grinblatt and Titman (1989), Grinblatt, Titman and Wermers (1995), Daniel, Grinblatt, Titman and

² More generally, the idea that agents' incentives are weaker when they do not have control over asset allocation or investment decisions is in the work of Grossman and Hart (1986), Hart and Moore (1990) and Hart (1995).

³ Other more behavioral sources of organizational diseconomies are found in the decision-making in groups literature (for reviews of this voluminous literature, see Burnstein and Vinokur (1977) and Vinokur (1971)).

Wermers (1997)), but they charge such high fees that the net fund returns are significantly negative (Jensen (1968), Malkiel (1995), Gruber (1996)). So it appears that mutual fund investors are naïve in that they pay too much in fees and may be susceptible to mutual fund marketing (see, e.g., Gruber (1996), Sirri and Tufano (1998) and Zheng (1999)).

Importantly, money managers are likely to want to manage large funds for a variety of agency reasons. One reason is that managers get compensated based on a fixed percentage of assets under management; another might be empire building. So the board of directors who oversee a fund cannot easily address the disadvantages of scale (assuming that they want to in the first place) by capping the amount of money managers can control. Moreover, practitioners are somewhat confused about the effect of size on performance to begin with. In this sense, our paper may have some normative implications for the mutual fund industry.

Using data from 1962-1999, we test the hypothesis that fund size erodes performance because of organizational diseconomies. We will measure performance with both gross and net fund returns (before and after management and administrative fees are deducted, respectively). As we show below, our conclusions are qualitatively unchanged by the performance measure used.

We find that fund performance indeed declines with fund size as measured by a fund's total net assets. For instance, using CAPM-adjusted, four-quarter gross returns, funds in fund size quintile 2 outperform funds in fund size quintile 4 by an average of 1.3% over the next year. (We are using past fund size to predict fund returns going forward.) The analogous number using four-quarter net returns is 1% over the next year. The inverse relationship between fund size and performance is somewhat dampened but is still economically and statistically significant when we use other performance benchmarks such as the Fama-French (1993) three-factor model. The corresponding numbers for gross and net

fund returns adjusted using the Fama-French three-factor model are 98 and 68 basis points over the next year, respectively.

There are of course a number of other alternative explanations for why fund performance is inversely related to size. One worry is that size is a proxy for some other fund characteristics that affect performance. So we regress the various adjusted returns on not only fund size (as measured by the log of total net assets), but also include in the regressions fund turnover, age, expense ratio and total load. While some of these other fund characteristics are statistically significant in our regressions, they do not really affect our estimate of fund size on performance. Even though the dataset we use is survivorship bias free, such biases may still be most acute among the smallest funds. But even when we drop these smallest funds from our analysis, our findings are largely unchanged.

Nonetheless, there are less mechanical stories that one can tell about fund size and performance that controlling for these aforementioned fund characteristics and biases do not address. To this end, we proceed to test a number of auxiliary predictions of our organizational diseconomies hypothesis.

One prediction is that if fund size affects performance through some type of organizational diseconomies, then size ought to erode performance much more for small cap funds, i.e. funds that play small stocks. The reason is that small cap funds need to generate new stock ideas with growth in their asset base. So they most desperately need to hire managers and organize them well. In contrast, for large cap funds, asset base growth may be readily accommodated by increasing positions in large cap stocks with little price impact.

Consistent with this prediction, we find that fund size indeed matters more for performance among small cap funds than other funds. As we will argue below in Section II, looking at the effect of fund size on performance by fund style rules out a number of alternative stories that do not have to do with organizational diseconomies.

Another prediction that we analyze is motivated by the analysis in Stein (2002) that small organizations outperform large ones at tasks that involve the processing of soft information---i.e., information that cannot be directly verified by anyone other than the agent who produces it. The idea is to compare the investments of large and small funds in local stocks (stocks nearby to where a fund is headquartered). Investing in such companies more likely requires that the organization process soft information as opposed to a strictly quantitative investing approach, which would typically process hard information like price-to-earnings ratios. As we explain below in Section II, to the extent that organizational diseconomies are driving the fund size-performance relationship that we document, small funds ought to invest in more local stocks and to do better at picking them than large funds. We also confirm this prediction.

These findings collectively support our hypothesis that fund size erodes performance because of organizational diseconomies. As we detail in the Conclusion, our findings have normative implications for the mutual fund industry and the ongoing question of the boundaries of the firm first posed by Coase (1937).

Our paper proceeds as follows. In Section II, we develop our hypothesis and summarize the testable predictions. We describe the data in Section III and the performance benchmarks in Section IV. In Sections V, we lay out our main findings. We conclude in Section VI.

II. Hypothesis Development and Testable Predictions

In this section, we develop our hypothesis and describe the testable predictions at the heart of our paper. Whereas one manager can easily invest a small asset base, it takes many managers to invest a large asset base. As a result, organizational form matters for large funds

and not small ones. To the extent that there are organizational diseconomies, then large funds ought to perform worse than small funds.

Our empirical strategy utilizes cross-sectional regressions to see whether fund performance declines with fund size. Now, we could have adopted a fixed-effects approach by looking at whether changes in a fund's performance are related to changes in its size. However, such an approach is subject to a regression-to-the-mean bias. A fund with a year or two of lucky performance will experience an increase in fund size. But performance will regress to the mean, leading to a spurious conclusion that an increase in fund size is associated with a decrease in fund returns. Measuring the effect of fund size on performance using cross-sectional regressions is less subject to such biases and may be conservative in that large funds are likely to be good funds, i.e. they would not become large otherwise.

However, a distinct disadvantage of using cross-sectional regressions is that fund size may be correlated with other fund characteristics that drive performance. For instance, small funds may be naively playing certain profitable strategies such as the Fama-French (1993) factors or momentum. A very conservative way to deal with this worry is to not give mutual funds any credit for these strategies. So we adjust mutual fund performance by the Fama-French three-factor model and this model augmented with the momentum factor of Jegadeesh and Titman (1993) as in Carhart (1997). In a similar manner, we can control for other fund characteristics in our regressions. We state our central test as the following:

Prediction 1: Fund performance declines with fund size controlling for a variety of performance benchmarks and other fund characteristics.

Even though controlling for different benchmarks and other fund characteristics alleviates some of the concern about certain alternative explanations, we still worry about other more subtle alternative explanations.

The one that we are most concerned about is that fund size is inversely related to performance because of fund incentives to lock in assets under management after a long string of good past performances.⁴ When a fund is small and has little reputation, the manager goes about the business of stock picking. But as the fund gets large because of good past performance, the manager may for various reasons lock in his fund size by being passive (or a “closet indexer” as practitioners put it). In other words, fund performance declines with fund size because of a simple one-agent story with certain incentives as opposed to a multi-agent story of organization.

The ex ante plausibility of this alternative story is somewhat mixed. On the one hand, the burgeoning empirical literature on career concerns suggests that fund managers ought to be bolder with past success (see, e.g., Chevalier and Ellison (1999) and Hong, Kubik and Solomon (2000)). On the other hand, the fee structure means that funds may want to lock in assets under management because investors are typically slow to pull their money out of funds.

To deal with this alternative hypothesis, we look to see whether the effect of size on performance varies by the style of the fund. In particular, our hypothesis suggests that this effect ought to be more pronounced among small cap funds.

Prediction 2: The inverse relationship between fund size and performance is more pronounced among small cap funds.

⁴ More generally, it may be that after many years of good performance, bad performance follows for whatever reason. We are offering here a plausible economic mechanism for why this might come about.

As we alluded to in the Introduction, small cap funds are more likely to need new stock ideas with asset base growth. So they are the ones that most need to organize well and hire more managers to cover more stocks. Otherwise, their performance gets eroded. So size ought to affect them more than other funds.

Importantly, existing research finds that there is little variation in incentives across small cap and other funds (see, e.g., Almazan, et.al. (2001). Hence, this prediction ought to help us discriminate between our hypothesis and the alternative one-agent story involving fund incentives. Moreover, since small cap funds tend to do better than other funds, it is not likely that our results are due to investors in small cap funds being more irrational than those investing in other funds.

The other issue of interest is whether fund performance depends on whether the fund belongs to a fund family complex. There are many fund families that just have a few funds and really only one active fund within a style class. And typically, the fund managers get to make the decisions on what to do with the assets under management. Therefore, a natural unit of analysis is the fund. But some funds belong to mega-fund-complexes such as Fidelity, which have many funds.

Some versions of our hypothesis suggest that family size, measured by number of funds in the family or by the total assets under management of the family, may affect the performance of funds in the family. For instance, Williamsonian diseconomies involving bureaucracies suggest that fund size affects performance more for fund that belong to large families.⁵ This allows us to discriminate among competing types of organizational diseconomies in Prediction 3:

⁵ If large families like Fidelity also tend to have larger funds, then the family size variable is correlated with the fund size variable and both may come in and fight it out in explaining performance.

Prediction 3: To the extent that fund size affects performance because of Williamsonian type diseconomies, we would expect fund size to erode performance more among funds that belong to large families.

To get a better picture of the nature of the organizational diseconomies driving our fund size-performance relationship, we conduct some empirical analysis motivated by Stein (2002). Stein argues that the degree to which a hierarchy adversely affects incentives (and hence the degree to which organization diseconomies matter) depends on the nature of the information that an organization is processing. If the information is soft, i.e. information that cannot be directly verified by anyone other than the agent who produces it, then agents have a harder time convincing their superiors of their ideas and there is more organizational diseconomies. Stock picking funds that have managers visit companies and use their judgment to value them are more likely to be trading on soft information. In contrast, index funds or quantitative funds that use methods like factor analysis are more likely to be trading on hard information. Hence, one testable implication of our organizational diseconomies hypothesis is that large funds are bad at or may not be able to continue to be stock pickers trading on soft information. Instead, they may have to go quantitative and trade on hard information.

Prediction 4: To the extent that fund size erodes performance because of the type of organizational diseconomies pointed out in Stein (2002), i.e. small funds are better than large ones at the processing of soft information, then small funds are more likely to invest in local companies and to do better at picking local companies than large funds, especially among small cap funds.

Our work in testing Prediction 4 builds on the very interesting work of Coval and Moskowitz (2001) whose central thesis is that mutual fund managers do have ability. They find that funds can earn superior returns on their local investments. They also document that small funds are more likely than large ones to benefit from these investments. We focus on the effect of size on fund portfolio compositions and use it to test our hypothesis that such effects ought to be more important for small cap funds, the set of funds in which organizational diseconomies are most likely to matter.

Our work in Prediction 4 is similar to the work of Berger et.al. (2002). They test the idea in Stein (2002) that small organizations are better than large ones in activities that require the processing of soft information in the context of bank lending to small firms. They find that large banks are less willing than small ones to lend to informationally difficult credits such as firms that do not keep formal financial records. They also find that large banks lend at a greater distance, interact more impersonally with their borrowers, have shorter and less exclusive relationships and do not alleviate credit constraints as effectively.

Finally, our hypothesis suggests that how the fund is organized matters for whether or not scale affects performance. More concretely, suppose that the organizational diseconomies are due to the adverse effects of a hierarchy on managerial effort. Then an optimal organizational structure is to limit managers to a small pot of money and let them manage it as they choose. With such an organizational structure, scale will not affect performance. Whether this is achievable is another issue, which we will discuss in more detail in the Conclusion. Nonetheless, it is interesting to note that a crucial unobservable determinant of fund performance from our hypothesis is the nature of the incentives inside the fund.

With this in mind, an interesting question is whether our hypothesis predicts that the ratio of fund size to number of people in the organization ought to be a determinant of fund performance, i.e. the higher this ratio, is the worst the performance? The answer is no since it depends on how the fund is organized. A fund with a very low ratio of fund size to number of people may do worse without the right organizational form. Interestingly, Prather and Middleton (2002) find that the number of people managing a fund does not seem to predict performance.

III. Data

Our primary data on mutual funds comes from the Center for Research in Security Prices (CRSP) Mutual Fund Database for the years 1962-1999. Following many prior mutual fund studies, we restrict our analysis to diversified U.S. equity mutual funds. We exclude from our analyses bond funds, international funds and specialized sector funds.⁶ We also require that the funds in our sample have at least one year of reported fund returns and information on fund size.⁷

Table 1 reports summary statistics on this mutual fund sample. Panel A reports some mean statistics. In an average month, our sample includes about 825 funds with average total net assets (TNA) of 259 million and average expense ratio (as a fraction of year-end TNA) of one percent per year. In addition, the database reports turnover for each fund (defined as the minimum of purchases and sales over average TNA for the calendar year), which averages 56

⁶ More specifically, we select mutual funds in the CRSP Mutual Fund database that have reported one of the following investment objectives at any point in their lives. We first select mutual funds with Investment Company Data, Inc. (ICDI) mutual fund objective of ‘aggressive growth’, ‘growth and income’, or ‘long-term growth’. We then add in mutual funds with Strategic Insight mutual fund objective of ‘aggressive growth’, ‘flexible’, ‘growth and income’, ‘growth’, ‘income-growth’, or ‘small company growth’. Finally, we select mutual funds with Wiesenberger mutual fund objective code of ‘G’, ‘G-I’, ‘G-I-S’, ‘G-S’, ‘GCI’, ‘I-G’, ‘I-S-G’, ‘MCG’, or ‘SCG’.

⁷ We require one-year of past fund returns as we will need it to form benchmark portfolios based on past performance. We have also replicated our analysis without this restriction. The only difference is that the sample includes more small funds. But the results are unchanged.

percent per year. These funds charge a total load of about 4.4 percent (as a percentage of new investments) on average. The average fund age is sixteen years. We have a total of 5138 funds and 33,942 fund years in our sample. These summary statistics are similar to those reported in Carhart (1997).⁸ So we can take comfort that our sample is similar to existing mutual fund studies.

Table 1 also reports these summary statistics for each mutual fund size quintile as well as for the sample of all mutual funds excluding the smallest quintile. The interesting thing to note is that there is quite a substantial spread in fund size. The funds in the smallest quintile have an average TNA of only about five million dollars, whereas funds in the top quintile have an average TNA of over one billion dollars. Since the funds in the smallest quintile are quite small, we have to be especially careful that funds in the smallest quintile may have certain performance biases.

Panel B of Table 1 reports the time-series averages of the cross-sectional correlations between various fund characteristics. The obvious patterns are that expense ratio varies inversely with fund size (-.36), while total load and fund age vary positively with fund size (.18 and .42 respectively). The relationship between fund size and turnover is ambiguous (only .08). Nonetheless, it is apparent from Panel B that we need to control for these fund characteristics in estimating the cross-sectional relationship between fund size and performance. Panel C reports the analogous numbers for only funds in fund size quintiles 2-5. The results are similar to those in Panel B.

IV. Fund Performance Benchmarks

We employ a number of performance benchmarks. Panel A reports the summary statistics for the various portfolios that make up our performance benchmarks. Among these

⁸ At the end of 1993, which is when Carhart's sample ends, we have about 1750 funds in our sample, very close to the number reported by Carhart.

are the returns on the CRSP value weighted stock index net the one-month Treasury rate (VWRF), the Fama-French (1993) SMB (small stocks minus large stocks) and HML (high book-to-market stocks minus low book-to-market stocks) portfolios, and a Jegadeesh and Titman (1993) momentum portfolio MOM12 (buy/sell based on past twelve month returns and hold for one-month). The summary statistics for these portfolios are similar to those reported in other studies.

Since we are interested in the relationship between fund size and performance, we begin by sorting mutual funds at the beginning of each month based on the quintile rankings of their previous-month TNA.⁹ We then track these five portfolios for one month and use the entire time series of their monthly net returns to calculate the loadings to the various factors for each of these five portfolios.

For each month, each mutual fund inherits the loadings of the one of these five portfolios that it belongs to. In other words, if a mutual fund stays in the same size quintile through out its life, its loadings remain the same. But if it moves from one size quintile to another during a certain month, it then inherits a new set of loadings with which we adjust its next month's performance.

Panel B reports the loadings of the five size sorted mutual fund portfolios using Capital Asset Pricing Model (CAPM) of Sharpe (1964):

$$r_{i,t} = \alpha_i + \beta_i \text{VWRF}_t + e_{i,t} \tag{1}$$

where $r_{i,t}$ is the (net fund) return on our five size-sorted mutual fund portfolios in period t in excess of the one-month T-bill return. Notice that there is only a slight variation in the

⁹ We also sort mutual funds by their past twelve-month returns to form benchmark portfolios. Our results are unchanged when using these benchmark portfolios. We omit these results for brevity.

market beta from the smallest to the largest size portfolio: the smallest portfolio has a somewhat smaller beta, but not by much. As other papers have found, the average mutual fund has a beta of around .91, likely reflecting the fact that mutual funds hold some cash or bonds in their portfolios.

Moreover, like other papers, net fund returns are on average negative. Using market-adjusted returns, funds under perform the market by about 8 basis points a month or 96 basis points a year. Using CAPM-adjusted returns, funds under perform only by 3 basis points a month or 36 basis points a year. More importantly, we see that there is already a pattern in which performance appears to decrease with fund size. Using either market-adjusted or CAPM-adjusted returns, the spread between funds in fund size quintile 1 and 5 is about 8 basis point a month or 96 basis points a year.

We caution against making too much of these patterns since they are only monthly returns and they are not always monotonically decreasing in fund size. Moreover, it is not clear whether they will persist when we look at longer horizons. Hence, we will look more carefully at these patterns below by using 4-quarter returns.

We consider two additional performance measures, the Fama-French three-factor model and this three-factor model augmented by a momentum factor, MOM12, as in Carhart (1997):

$$r_{i,t} = \alpha_i + b_i \text{VWRF}_t + s_i \text{SMB}_t + h_i \text{HML}_t + e_{i,t} \quad (2)$$

$$r_{i,t} = \alpha_i + b_i \text{VWRF}_t + s_i \text{SMB}_t + h_i \text{HML}_t + m_i \text{MOM12}_t + e_{i,t} \quad (3)$$

where SMB, HML and MOM12 are returns on value-weighted, zero-investment, factor-mimicking portfolios for size, book-to-market equity and one-year momentum in stock returns.

We want to emphasize that the interpretation of these performance measures (unlike the first) is far from clear. A strict risk-adjusted returns interpretation is unwarranted since there is vibrant debate over how to interpret the Fama-French three-factor model. This is especially true for the MOM12 factor since most of the work over the last five years on momentum strongly argues against a risk-based interpretation.

More plausibly, we can think of these adjustments as informing us as to the source of mutual fund performance. But to be conservative, we will not give mutual funds credit for these strategies and assume that they just happen to be playing these strategies.

Panel B reports the loadings for these two models. We see that small funds tend to have higher loadings on SMB and HML, but large funds tend to load heavier on momentum. For instance, the loading on SMB for funds in quintile 1 is .28 while the corresponding loading for funds in quintile 5 is .08. And whereas large funds load negatively on HML (-.06 for the largest funds), the smallest funds load positively on HML (.04). (Falkenstein (1996) also finds some evidence that larger funds tend to play large and glamour stocks by looking at fund holdings.) Interestingly, large funds are slightly more likely to play momentum, though not by much.

When we look at the Fama-French three-factor alphas, the performance spread between small and large funds understandably shrinks, but it looks like there is still a healthy spread of about 4 basis points a month or 48 basis points a year. When we look at the four-factor alphas, the spread in performance between small and large funds is only slightly smaller than when we use the market-adjusted and CAPM-adjusted returns.

We have also re-done all of our analysis by calculating these loadings by using gross fund returns instead of net fund returns. Monthly gross fund returns are calculated by adding back the expenses to net fund returns by taking the year-end expense ratio and dividing it by twelve and adding it to the monthly returns during the year. The results are very similar to using net fund returns. So for brevity, we will just use the loadings summarized in Table 2 to adjust fund performance (whether it be gross or net returns) below.

Moreover, we have also calculated loadings for each mutual fund. Using the entire time series of a particular fund (we require at least 36 months of data), we calculate the loadings using equations (1)-(3). This technique is not as good in the sense that we have a much more intensive requirement on selection. In any case, our results are unchanged, so we omit these results for brevity.

V. Empirical Results

A. Baseline effect of fund size on performance

We begin our analysis of Prediction 1, fund performance declines with fund size, in Table 3. Panel A reports the mean gross 4-quarter fund performance by the five fund size quintiles. The first row reports performance using simple market-adjusted returns. Notice that performance monotonically declines with fund size, with funds in the smallest quintile having an average 4-quarter return of 1.2% while funds in the largest quintile under performs the market by 72 basis points. The difference of nearly 2% per year is both economically and statistically significant. Similar results hold using CAPM-adjusted returns.

Looking at the 3-factor and 4-factor adjusted returns, we still see that performance monotonically declines with size across the five size quintiles. The interesting thing to note is that this decline is most muted when using the 3-factor adjusted returns. This is not

surprising since small funds tend to load positively on SMB and HML, thereby leading to a less dramatic spread in performance between small and large funds.

While the findings reported in Table 3 clearly indicate that size is a strong predictor of performance, there are clearly a number of alternative explanations for this finding other than our hypothesis of organizational diseconomies. For instance, size may be measuring whether a fund is active or passive. While we have tried our best to rule out passive funds in our sample construction, it is possible that some funds may just be indexers. And if it turns out that indexers happen to be large funds because more investors put their money in such funds, then size may be picking up differences in the degree of activity among funds. One way to address this alternative explanation is to use fund turnover as a proxy for whether a fund is active or passive.

More generally, since we have a number of other fund characteristics such as fund turnover, age, expense ratio, and total load, we can measure the effect of size on performance by controlling for these characteristics in a regression framework. Panel B of Table 3 tries to do just this. We run a cross-section regression of each fund's performance (measured in percents) on size (as measured by the Log of TNA) and these other fund characteristics. To the extent that the relationship between size and performance is induced by other fund characteristics, we would expect the coefficient in front of Log TNA to be significantly dampened.

Notice that the coefficient in front of Log TNA is negative and statistically significant. The coefficient is roughly $-.25$ using market-adjusted and CAPM-adjusted returns. Since one standard deviation of Log TNA is 1.87, then a two standard deviation shock to fund size means that performance changes by $-.25$ of 3.7, or $-.94$ (94 basis points),

which is similar to the magnitude obtained without the controls. The coefficient is $-.15$ using the other two performance benchmarks.

Another alternative explanation for our finding is a subtle form of survivorship bias which Elton, Gruber and Blake (2000) term an omission bias. They argue that among small funds less than 15 million dollars, some only report fund information on an annual basis. And those who only report annually under perform those who report quarterly or monthly. Hence, if we restrict our sample to mutual funds that have monthly observations, then we will be susceptible to a form of survivorship bias, which they term an omission bias. When we use monthly, overlapping observations, we are guilty of selecting on funds that report information monthly.

This critique really only applies to funds in quintile 1, since funds in the other quintiles typically have fund sizes greater than 15 million dollars. We address this critique by re-doing our analysis using only funds between size quintiles 2-5. Panel C of Table 3 reports the results. Our findings are qualitatively unchanged.

Panel A of Table 4 reports the mean net fund performance by the five fund size quintiles. The key things to note is that there is a pronounced monotonically declining pattern of performance with size, though the spread is less dramatic than using gross fund returns. For instance, using simple market-adjusted returns, the difference between the smallest and largest quintile is still a healthy 1.6 percent a year. Panels B and C control for various fund characteristics. The coefficients in front of Log TNA are still negative, but they are only marginally significant for the three-factor and four-factor benchmarks. The magnitudes are still economically interesting.

B. Effect of fund size on performance by fund style

In this section, we report our analysis of Prediction 2, that fund size erodes performance more among small cap funds. In the CRSP Mutual Fund Database, each fund self-reports its style, and one of the categories is Small Cap Growth. So, we identify funds in our sample as either Small Cap Growth if it has ever reported itself as such or Not Small Cap Growth. (Funds rarely change their self-reported style.) On average, there are 104 such funds each year. Recall that the corresponding number for the overall sample is 825. So, Small Cap Growth represents a small but healthy slice of the overall population. Interestingly, the average TNA of these funds is 150 million dollars with a standard deviation of 349 million dollars. The average TNA of a fund in the overall sample is 259 million dollars with a standard deviation of 755 million dollars. So, Small Cap Growth funds are somewhat smaller than the typical fund. But they are still quite big and there is a healthy fund size distribution among them, so that we are measure the effect of fund size on performance.

Table 5 reports what happens to the results in Tables 3 and 4 when we augment the regression specifications by including a dummy indicator $\text{Ind}_{\{\text{not SCG}\}}$ (that equals one if a fund is not Small Cap Growth and zero otherwise) and an additional interaction term involving Log TNA and $\text{Ind}_{\{\text{not SCG}\}}$. Panel A reports the results for gross, 4-quarter returns. Notice that the coefficient in front of $\text{Ind}_{\{\text{not SCG}\}}$ is negative and statistically significant. This makes sense since small cap stocks have historically had higher returns than large cap stocks. Importantly, the coefficient in front of the interaction term is positive and statistically significant. This is the sign predicted by our theory since it says that for Non Small Cap Growth funds, there is a smaller effect of fund size on performance. The effect is economically interesting as well.

C. Effect of fund size on performance by family size

In this section, we report our analysis of Prediction 3, which attempts to discriminate among competing types of organizational diseconomies. If Williamsonian style organizational diseconomies are behind the relationship between size and performance, one might expect that fund size matters more for performance among funds that belong to large families, since bureaucracy ought to be more important in huge fund complexes.

We test this prediction in Table 6. We augment our baseline regressions in Tables 3 and 4 by adding in two additional independent variables. The first is Log of the family size that the fund belongs to, where family size is simply the number of funds in a family. (Similar results obtain when we use a family's total net assets under management.) The second is this variable interacted with Log of fund size. To the extent that Williamsonian style diseconomies are matter, one would expect that the coefficient in front of the interaction term to be negative and statistically significant. In fact, the coefficient is not statistically different from zero and is of the wrong sign. Moreover, it does not appear that family size plays a large role in predicting fund returns above and beyond fund size since the coefficient in front of Log family size (while negative) is not statistically significant. In contrast, our fund size variable remains economically and statistically significant as before.

D. Effect of fund size on investments in local stocks

In this section, we report our analysis of Prediction 4 that small funds are more likely to invest in and pick more profitable local stocks than large funds. The CRSP Mutual Fund Database does not have any information about fund positions in individual stocks. So we turn to the CDA Spectrum Database that has the stock positions of funds reported on a quarterly basis. We take two years or eight quarters worth of data from 1997-1998 and analyze the effect of fund size on the composition of fund stock holdings and the performance of these holdings. Since we do not intend to compare the performance of the

overall fund with the performance of their stock holdings, we do not merge these two databases. Indeed, others such as Wermers (2000) have done so and a number of observations are lost in the merge. Moreover, the process of merging these two databases is quite cumbersome.

The CDA Spectrum Database does not have the same information on fund characteristics as the CRSP Mutual Fund Database. We are able to construct from the fund stock holdings data a proxy for the fund size, which is simply the value of the fund's stock portfolio at the end of a quarter. While this is not exactly the same as the asset base since funds hold cash and bonds, we believe the proxy is a reasonable one since we will look at the tails of the size distribution to draw inferences, i.e. compare very small funds to other funds. Moreover, the noise in our fund size measure does not obviously bias our estimates.

In addition, we can construct better style controls for each fund by looking at their stock holdings. We use a style measure constructed by Daniel, Grinblatt, Titman and Wermers (1997) that we call the DGTW style for brevity. For each month, each stock in our sample is characterized by where they fall in the (across stocks) size quintiles, book-to-market quintiles and momentum quintiles. So a stock in the bottom of the size, book-to-market and momentum quintiles in a particular month would be characterized by a triplet (1,1,1). For each fund, we can characterize its style along the size, book-to-market and momentum dimension by taking the average of the DGTW characteristics of the stocks in their portfolio weighted by percentage of the value of their portfolio that they devote to each stock. We can then define a Small Cap fund as one whose DGTW measure falls in the bottom 10 percent when compared to other funds.

Table 7 reports the effect of fund size on the percentage of the value of a fund's portfolio devoted to local stocks, where locality is defined relative to the headquarters of the fund as in Coval and Moskowitz (2001). (The dependent variable is the value of the local

stocks in the fund portfolio divided by the total value of the stocks in the fund portfolio.) The first independent variable is Small Fund, which is a dummy variable that equals one if the fund is in the bottom 10% of the fund size distribution. Small Cap Fund equals one if a fund has an average DGTW score for its stocks that is in the bottom 10% across funds. The regressions always have Fund City Effects as controls. From column (1), small funds are more likely to invest a larger percentage of their portfolio in local stocks as are small cap funds. In column (2), the coefficient of interest is the interaction term involving small and small cap funds. It is positive and statistically significant which is consistent with our Prediction 3.

One interesting question is the degree to which these findings are driven by a family size effect since larger funds are likely to be located in larger families. In column (3), we add a family size control measured by the number of funds in the family. This does not do much to our variables of interest though it is positive but only marginally significant. This would then say that larger families invest in more local stocks, which means that family size cannot be driving my fund size results. To be even more conservative, we introduce Family Size Effects that are dummies for where a fund's family falls in the deciles of family size. Again, the estimates of interest are unchanged.

In Table 8, we then test to see whether the local stocks picked by small funds do better than those picked by large funds. In column (1), we find that small funds and small cap funds do better at investing in local stocks. In column (2), we add an interaction term involving these two variables and find that the performance difference between small funds and other funds is especially big in small cap funds. These findings continue to hold even when we control for family size effects in columns (3) and (4).

The findings in Tables 7 and 8 suggest that the performance differences between small and large funds have something to do with their different ability to invest in local stocks. Moreover, they indicate that our fund size findings have little to do with family size.

Note that Tables 7 and 8 only report the results using the cross-section in September 1997. We have replicated our analysis using the other quarters in from 1997-1998. The results are very robust across quarters.

VI. Conclusion

To the best of our knowledge, we are the first to argue for the organizational diseconomies perspective when thinking about fund size and performance. While others have found suggestive evidence that fund performance declines with size, we are the first to find the strong economic magnitudes as well as control for a large number of explanations that may drive the relationship. Moreover, we deepen our analysis by finding that this relationship is most pronounced among small cap funds, just as our hypothesis predicts. We also rule out that organizational diseconomies related to bureaucracy costs are driving our results. And we find evidence that that this relationship is due to the differential investments in local stocks across small and large funds, consistent with a type of organizational diseconomies pointed out by Stein (2002).

Our findings are important for a couple of reasons beyond providing a better understanding of the importance of organizational diseconomies in active money management. First, they may have normative implications for how funds are organized. Indeed, to this day, there are still contrasting views on how to go about dealing with growth in asset base. Some practitioners still see asset base growth as a good thing when accompanied with good past performance. Others have seen more clearly the importance of

having the right organizational framework to deal with growth. Our findings provide additional evidence supporting the latter view.

Finally, our findings have relevance for the ongoing research into the Coasian question of the determinants of the boundaries of the firm. While an enormous amount of theoretical research has been done on this question, there has been far less empirical work. Along with papers such as Berger et.al. (2002), our paper provides new insights into the nature of the boundaries of the firm. Our findings also suggest that mutual funds may be an invaluable laboratory with which to study related issues in organization. Unlike most corporations, data on mutual funds are plentiful because of disclosure regulations and the tasks and performance of mutual funds are measurable. We plan to better refine our understanding of the nature of organizations in the future using this laboratory.

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Table 1: Summary Statistics

This table shows the summary statistics of the characteristics of the mutual funds used in this study. The number of funds is the number of mutual funds that meets our selection criteria for being a domestic active mutual fund in each month. TNA is the total net assets of funds in millions of dollars. Expense ratio is total annual management and administrative expenses divided by average TNA. Turnover is the fund turnover reported by CRSP, which is the minimum of aggregate purchases and sales of securities divided by the average TNA. Total load is the total front-end, deferred and rear-end charges as a percentage of new investments. Fund age is the number of years since the organization of the mutual fund. TNA is reported monthly. All other fund characteristics are reported one a year. The sample is from December 1962 to December 1999. Panel A reports the time-series averages of monthly cross-sectional averages and monthly cross-sectional standard deviations of mutual fund characteristics. The time-series averages of monthly cross-sectional standard deviations are shown in brackets. Panel B reports the time-series averages of the cross-sectional correlations between mutual fund characteristics.

Panel A: Time-series averages of cross-sectional averages and standard deviations.

Sample	Mutual Fund Size Quintile					All Funds	Quintiles 2-5
	1	2	3	4	5		
Number of Funds	165.3	164.9	164.9	164.9	164.5	824.7	659.3
TNA (\$ million)	4.9 [3.2]	21.9 [7.0]	59.3 [15.9]	161.2 [53.3]	1052.6 [1408.5]	259.1 [754.6]	323.0 [830.7]
LogTNA (\$ million)	1.19 [0.95]	2.96 [0.33]	3.97 [0.27]	4.95 [0.33]	6.44 [0.73]	3.90 [1.87]	4.58 [1.36]
Expense Ratio (% per year)	1.35 [1.01]	1.13 [0.57]	0.97 [0.44]	0.87 [0.36]	0.69 [0.31]	1.00 [0.65]	0.92 [0.47]
Turnover (% per year)	45.1 [78.7]	58.0 [72.0]	61.5 [69.5]	61.2 [63.0]	52.5 [54.1]	55.7 [70.2]	58.3 [66.4]
Total Load (%)	3.53 [3.37]	4.31 [3.34]	4.40 [3.37]	4.61 [3.39]	5.32 [2.86]	4.43 [3.37]	4.66 [3.32]
Fund Age (years)	9.0 [8.5]	12.5 [10.7]	15.1 [12.6]	18.6 [14.1]	25.2 [14.8]	16.0 [13.7]	17.8 [14.1]

Panel B: Time-series averages of (monthly) correlations between fund characteristics.
 [Using all funds]

	TNA	Log TNA	Exp. Ratio	Turnover	Tot. Load	Fund Age
TNA	1.00	0.61	-0.23	-0.05	0.12	0.31
Log TNA		1.00	-0.36	0.04	0.18	0.42
Exp. Ratio			1.00	0.15	-0.05	-0.19
Turnover				1.00	0.04	-0.02
Total Load					1.00	0.17
Fund Age						1.00

Panel C: Time-series averages of (monthly) correlations between fund characteristics.
 [Excluding smallest 20% of funds]

	TNA	Log TNA	Exp. Ratio	Turnover	Tot. Load	Fund Age
TNA	1.00	0.72	-0.27	-0.08	0.11	0.29
Log TNA		1.00	-0.38	-0.06	0.13	0.37
Exp. Ratio			1.00	0.24	0.01	-0.23
Turnover				1.00	0.02	-0.06
Total Load					1.00	0.16
Fund Age						1.00

Table 2: Summary Statistics for Benchmark Portfolios

This table reports the summary statistics for the factors and benchmark portfolios. Panel A reports the summary statistics of the factors. VWRF is the rate of return on the CRSP value-weighted stock index in excess of the one-month Treasury rate. SMB is the return on the factor-mimicking portfolio for the size factor from Fama and French (1993). HML is the return on the factor-mimicking portfolio for the book-to-market factor from Fama and French (1993). MOM12 is the return on the factor-mimicking portfolio for the momentum factor. Panels B and C report the summary statistics of mutual fund portfolios sorted by past TNA. Equal-weighted portfolios of mutual funds are formed at the beginning of each month based on the decile rankings of their previous month TNA. The portfolios are held until the end of the month. Panel B reports the average market-adjusted monthly return of the benchmark portfolios and the standard deviation of unadjusted monthly returns. Panel B also reports the alphas and the betas from CAPM. Panel C reports the alphas and the factor-loadings from Fama and French 3-factor model and the 4-factor model. The sample period is from December 1962 to December 1999.

Panel A: Summary statistics of factor-mimicking portfolios.

Factor	Mean Return	SD of Return	Cross-correlations			
			VWRF	SMB	HML	MOM12
VWRF	0.58%	4.37%	1.00	0.32	-0.39	-0.02
SMB	0.17%	2.90%		1.00	-0.16	-0.30
HML	0.34%	2.63%			1.00	-0.15
MOM12	0.96%	3.89%				1.00

Panel B: Summary statistics and CAPM loadings of mutual fund portfolios sorted by past TNA.

Portfolio	Mean Market-Adjusted Return	Std Dev of Total Return	CAPM	
			Alpha	VWRF
1 (small)	-0.05%	3.96%	0.02%	0.88
2	-0.06%	4.06%	-0.01%	0.91
3	-0.05%	4.15%	-0.01%	0.93
4	-0.12%	4.08%	-0.08%	0.92
5 (large)	-0.12%	4.04%	-0.07%	0.92

Panel C: Factor loadings from the 3-factor model and from the 4-factor model of mutual fund portfolios sorted by past TNA.

Portfolio	3-Factor Model				4-Factor Model				MOM12
	Alpha	VWRF	SMB	HML	Alpha	VWRF	SMB	HML	
1 (low)	-0.01%	0.83	0.28	0.04	-0.04%	0.83	0.29	0.05	0.03
2	-0.02%	0.85	0.26	-0.01	-0.08%	0.85	0.28	0.00	0.05
3	0.00%	0.88	0.22	-0.05	-0.07%	0.88	0.24	-0.03	0.07
4	-0.05%	0.87	0.18	-0.06	-0.12%	0.87	0.20	-0.04	0.06
5 (large)	-0.05%	0.89	0.08	-0.06	-0.10%	0.89	0.10	-0.05	0.05

Table 3: Baseline Effect of Fund Size On Performance Using Gross Fund Returns

This table shows the relationship between risk-adjusted mutual fund returns and the size of the mutual fund at the beginning of the period. All mutual fund returns are calculated before deducting operating expenses. One-month mutual fund return is calculated in excess of the market model, the CAPM, the Fama-French 3-Factor model, and the 4-Factor model. The dependent variable in each case is the cumulative (buy-hold) 12-months ahead future returns based on the one-month risk-adjusted mutual fund returns. Panel A shows the risk-adjusted mutual fund returns within each size quintile. Mutual funds are first sorted into quintiles based on their beginning of the period TNAs. The entries are the time-series averages of the cross-sectional average cumulative risk-adjusted returns within each size quintile. The brackets show the time-series averages of the cross-sectional standard deviations of fund returns. The last column shows the differences in the averages with serial-correlation adjusted t-statistics in parentheses. Panels B and C show the Fama-Macbeth (1973) regression estimates of future cumulative risk-adjusted mutual fund returns on beginning of the period mutual fund characteristics. The independent variables are all measured at the beginning of the period. The t-statistics are adjusted for serial correlations and are shown in parentheses. The last row shows the time-series averages of the R²'s from the Fama-Macbeth (1973) regressions at each period.

Panel A: Market-adjusted, CAPM, 3-factor and 4-factor returns by fund size quintiles using 4-quarter returns

	Mutual Fund Size Quintile					Difference
	1	2	3	4	5	1-5
Market-Adj	1.20% [12.27%]	0.75% [10.80%]	0.32% [10.27%]	-0.50% [9.45%]	-0.72% [7.71%]	1.93% (6.20)
CAPM	1.96% [12.33%]	1.32% [10.84%]	0.77% [10.31%]	0.02% [9.50%]	-0.20% [7.74%]	2.15% (6.98)
3-Factor	1.61% [12.31%]	1.29% [10.87%]	0.97% [10.33%]	0.31% [9.53%]	0.15% [7.77%]	1.46% (6.81)
4-Factor	1.20% [12.26%]	0.58% [10.79%]	0.10% [10.26%]	-0.48% [9.47%]	-0.51% [7.72%]	1.71% (7.93)
No. of months	433	433	433	433	433	433

Panel B: Dependent variable is 4-quarter gross fund returns (all fund size quintiles 1-5)

	Market-Adj	Beta-Adj	3-Factor	4-Factor
Intercept	1.137 (2.64)	1.856 (4.53)	1.496 (4.61)	0.988 (3.06)
LogTNA _{i,t-1}	-0.248 (3.70)	-0.287 (4.52)	-0.146 (2.30)	-0.195 (3.09)
Turnover _{i,t-1}	0.001 (0.72)	0.001 (0.70)	0.001 (0.64)	0.001 (0.51)
Age _{i,t-1}	-0.031 (3.05)	-0.031 (3.06)	-0.032 (3.11)	-0.031 (3.04)
Expense Ratio _{i,t-1}	0.233 (0.90)	0.229 (0.88)	0.206 (0.82)	0.202 (0.83)
Total Load _{i,t-1}	0.053 (3.48)	0.053 (3.47)	0.051 (3.36)	0.052 (3.39)
No. of months	433	433	433	433
Average R ²	6.98%	7.01%	6.10%	6.22%

Panel C: Dependent variable is 4-quarter gross fund returns (only fund size quintiles 2-5)

	Market-Adj	Beta-Adj	3-Factor	4-Factor
Intercept	0.603 (1.46)	1.148 (2.94)	1.032 (2.27)	0.181 (0.39)
LogTNA _{i,t-1}	-0.254 (4.15)	-0.260 (4.28)	-0.161 (2.34)	-0.142 (2.07)
Turnover _{i,t-1}	0.003 (1.77)	0.003 (1.77)	0.003 (1.75)	0.003 (1.73)
Age _{i,t-1}	-0.020 (2.06)	-0.020 (2.10)	-0.020 (2.07)	-0.020 (2.05)
Expense Ratio _{i,t-1}	0.783 (1.94)	0.780 (1.93)	0.727 (1.84)	0.719 (1.84)
Total Load _{i,t-1}	0.048 (2.95)	0.048 (2.98)	0.048 (2.96)	0.048 (2.99)
No. of months	433	433	433	433
Average R ²	7.68%	7.67%	6.79%	6.77%

Table 4: Baseline Effect of Fund Size On Performance Using Net Fund Returns

This table shows the relationship between risk-adjusted mutual fund returns and the size of the mutual fund at the beginning of the period. All mutual fund returns are calculated net of operating expenses. One-month mutual fund return is calculated in excess of the market model, the CAPM, the Fama-French 3-Factor model, and the 4-Factor model. The dependent variable in each case is the cumulative (buy-hold) 12-months ahead future returns based on the one-month risk-adjusted mutual fund returns. Panel A shows the risk-adjusted mutual fund returns within each size quintile. Mutual funds are first sorted into quintiles based on their beginning of the period TNAs. The entries are the time-series averages of the cross-sectional average cumulative risk-adjusted returns within each size quintile. The brackets show the time-series averages of cross-sectional standard deviations of fund returns. The last column shows the differences in the averages with serial-correlation adjusted t-statistics in parentheses. Panels B and C show the Fama-Macbeth (1973) regression estimates of future cumulative risk-adjusted mutual fund returns on beginning of the period mutual fund characteristics. The independent variables are all measured at the beginning of the period. The t-statistics are adjusted for serial correlations and are shown in parentheses. The last row shows the time-series averages of the R^2 's from the Fama-Macbeth (1973) regressions at each period.

Panel A: Market-adjusted, CAPM, 3-factor and 4-factor returns by fund size quintiles using 4-quarter returns

	Mutual Fund Size Quintile					Difference
	1	2	3	4	5	1-5
Market-Adj	-0.25%	-0.42%	-0.70%	-1.36%	-1.41%	1.16%
	[12.10%]	[10.69%]	[10.18%]	[9.39%]	[7.67%]	(3.76)
CAPM	0.50%	0.15%	-0.21%	-0.85%	-0.88%	1.38%
	[12.16%]	[10.73%]	[10.21%]	[9.43%]	[7.70%]	(4.51)
3-Factor	0.15%	0.12%	-0.02%	-0.54%	-0.54%	0.69%
	[12.14%]	[10.76%]	[10.24%]	[9.47%]	[7.73%]	(3.22)
4-Factor	-0.25%	-0.59%	-0.88%	-1.35%	-1.20%	0.95%
	[12.09%]	[10.68%]	[10.16%]	[9.40%]	[7.68%]	(4.38)
No. of months	433	433	433	433	433	433

Panel B: Dependent variable is 4-quarter net fund returns (all fund size quintiles 1-5)

	Market-Adj	Beta-Adj	3-Factor	4-Factor
Intercept	0.389 (0.91)	1.105 (2.73)	0.747 (2.31)	0.239 (0.74)
LogTNA _{i,t-1}	-0.177 (2.67)	-0.215 (3.43)	-0.076 (1.20)	-0.125 (1.98)
Turnover _{i,t-1}	0.001 (0.58)	0.001 (0.56)	0.001 (0.49)	0.001 (0.36)
Age _{i,t-1}	-0.029 (2.87)	-0.029 (2.88)	-0.030 (2.93)	-0.029 (2.86)
Expense Ratio _{i,t-1}	-0.310 (1.20)	-0.318 (1.22)	-0.341 (1.36)	-0.343 (1.40)
Total Load _{i,t-1}	0.053 (3.50)	0.052 (3.49)	0.050 (3.38)	0.051 (3.41)
No. of months	433	433	433	433
Average R ²	6.99%	6.98%	6.17%	6.24%

Panel C: Dependent variable is 4-quarter net fund returns (only fund size quintiles 2-5)

	Market-Adj	Beta-Adj	3-Factor	4-Factor
Intercept	0.031 (0.08)	0.576 (1.51)	0.455 (1.02)	-0.394 (0.87)
LogTNA _{i,t-1}	-0.204 (3.38)	-0.209 (3.50)	-0.111 (1.63)	-0.092 (1.35)
Turnover _{i,t-1}	0.003 (1.61)	0.003 (1.61)	0.003 (1.60)	0.003 (1.57)
Age _{i,t-1}	-0.018 (1.86)	-0.018 (1.89)	-0.018 (1.86)	-0.018 (1.85)
Expense Ratio _{i,t-1}	0.146 (0.36)	0.140 (0.35)	0.086 (0.22)	0.083 (0.21)
Total Load _{i,t-1}	0.045 (2.80)	0.045 (2.82)	0.044 (2.80)	0.045 (2.83)
No. of months	433	433	433	433
Average R ²	7.67%	7.66%	6.81%	6.80%

Table 5: Effect of Fund Size on Performance by Fund Style

Panels A and B show the Fama-Macbeth regression estimates of future cumulative risk-adjusted mutual fund returns on beginning of the period mutual fund characteristics. The independent variables are all measured at the beginning of the period. $Ind_{\{not\ SCG\}}$ is a dummy variable which equals one if the self-reported fund style is not Small Cap Growth and zero otherwise. The t-statistics are adjusted for serial correlations and are shown in parenthesis.

Panel A: Gross fund returns, all fund size quintiles 1-5

	Market-Adj	Beta-Adj	3-Factor	4-Factor
Intercept	4.634 (5.19)	5.382 (5.96)	4.923 (6.82)	4.384 (6.15)
$Ind_{\{not\ SCG\}}$	-3.728 (4.78)	-3.759 (4.79)	-3.659 (4.70)	-3.627 (4.68)
$LogTNA_{i,t-1}$	-0.640 (3.50)	-0.687 (3.80)	-0.533 (2.96)	-0.582 (3.25)
$LogTNA_{i,t-1}Ind_{\{not\ SCG\}}$	0.430 (2.45)	0.439 (2.49)	0.426 (2.44)	0.427 (2.46)
$Turnover_{i,t-1}$	0.001 (0.47)	0.001 (0.45)	0.001 (0.39)	0.000 (0.26)
$Age_{i,t-1}$	-0.031 (3.27)	-0.031 (3.28)	-0.032 (3.34)	-0.031 (3.27)
$Expense\ Ratio_{i,t-1}$	0.209 (0.83)	0.206 (0.82)	0.185 (0.76)	0.181 (0.76)
$Total\ Load_{i,t-1}$	0.058 (3.68)	0.057 (3.65)	0.055 (3.55)	0.056 (3.57)
No. of months	433	433	433	433

Panel B: Net fund returns, all fund size quintiles 1-5

	Market-Adj	Beta-Adj	3-Factor	4-Factor
Intercept	3.774 (4.26)	4.520 (5.04)	4.061 (5.65)	3.524 (4.96)
Ind _{not SCG}	-3.610 (4.65)	-3.642 (4.66)	-3.540 (4.57)	-3.510 (4.55)
LogTNA _{i,t-1}	-0.547 (3.03)	-0.593 (3.32)	-0.440 (2.47)	-0.490 (2.77)
LogTNA _{i,t-1} Ind _{not SCG}	0.408 (2.35)	0.417 (2.39)	0.403 (2.34)	0.404 (2.36)
Turnover _{i,t-1}	0.001 (0.33)	0.001 (0.31)	0.000 (0.25)	0.000 (0.12)
Age _{i,t-1}	-0.029 (3.09)	-0.029 (3.10)	-0.030 (3.15)	-0.029 (3.09)
Expense Ratio _{i,t-1}	-0.335 (1.34)	-0.342 (1.36)	-0.364 (1.49)	-0.365 (1.53)
Total Load _{i,t-1}	0.057 (3.70)	0.056 (3.67)	0.054 (3.58)	0.055 (3.59)
No. of months	433	433	433	433

Table 6: Effect of Fund Size on Performance by Family Size

Panels A and B show the Fama-Macbeth regression estimates of future cumulative risk-adjusted mutual fund returns on beginning of the period mutual fund characteristics. The independent variables are all measured at the beginning of the period. LogFamSize is the log of the size of the family that the fund belong to, where family size is simply the number of funds belonging to the family. The t-statistics are adjusted for serial correlations and are shown in parenthesis.

Panel A: Gross fund returns, all fund size quintiles 1-5

	Market-Adj	Beta-Adj	3-Factor	4-Factor
Intercept	0.415 (0.93)	1.169 (2.82)	0.792 (2.07)	0.356 (0.94)
LogFamSize _{i,t-1}	-0.043 (0.38)	-0.065 (0.59)	-0.060 (0.55)	-0.118 (1.08)
LogTNA _{i,t-1}	-0.190 (2.22)	-0.240 (2.95)	-0.095 (1.11)	-0.166 (1.96)
LogTNA _{i,t-1} LogFamSize _{i,t-1}	0.013 (0.49)	0.020 (0.76)	0.018 (0.71)	0.034 (1.33)
Turnover _{i,t-1}	0.001 (0.65)	0.001 (0.63)	0.001 (0.57)	0.001 (0.44)
Age _{i,t-1}	-0.028 (2.80)	-0.028 (2.81)	-0.029 (2.86)	-0.028 (2.80)
Expense Ratio _{i,t-1}	-0.322 (1.21)	-0.330 (1.23)	-0.348 (1.35)	-0.352 (1.39)
Total Load _{i,t-1}	0.047 (3.15)	0.047 (3.14)	0.045 (3.05)	0.046 (3.09)
No. of months	433	433	433	433

Panel B: Net fund returns, all fund size quintiles 1-5

	Market-Adj	Beta-Adj	3-Factor	4-Factor
Intercept	1.214 (2.66)	1.972 (4.69)	1.592 (4.12)	1.156 (3.02)
LogFamSize _{i,t-1}	-0.080 (0.71)	-0.103 (0.92)	-0.096 (0.88)	-0.154 (1.41)
LogTNA _{i,t-1}	-0.275 (3.16)	-0.326 (3.96)	-0.179 (2.08)	-0.250 (2.92)
LogTNA _{i,t-1} LogFamSize _{i,t-1}	0.022 (0.84)	0.029 (1.11)	0.027 (1.05)	0.043 (1.66)
Turnover _{i,t-1}	0.001 (0.80)	0.001 (0.78)	0.001 (0.72)	0.001 (0.60)
Age _{i,t-1}	-0.030 (2.98)	-0.030 (2.99)	-0.031 (3.05)	-0.030 (2.98)
Expense Ratio _{i,t-1}	0.220 (0.83)	0.216 (0.81)	0.199 (0.77)	0.192 (0.76)
Total Load _{i,t-1}	0.048 (3.16)	0.048 (3.14)	0.046 (3.06)	0.047 (3.09)
No. of months	433	433	433	433

Table 7: The Effect of Fund Size on Investments in Local Stocks

The dependent variable is the percentage of the value of a fund's portfolio invested in local stocks. Small Fund equals one if a fund's size is in the bottom 10% of the fund size distribution and zero otherwise. Small Cap Fund equals one if a fund's Daniel, Grinblatt, Titman and Wermers (1997) small cap style score is in the bottom 10% across funds. Momentum Effects and Book to Market Effects control for other differences in fund styles. Data is from the end of September 1997. Robust standard errors are reported in parentheses.

	(1)	(2)	(3)	(4)
Small Fund	.0759 (.0080)	.0580 (.0086)	.0584 (.0086)	.0577 (.0086)
Small Cap Fund	.0515 (.0082)	.0340 (.0088)	.0341 (.0088)	.0310 (.0088)
Small Fund×Small Cap Fund		.1244 (.0223)	.1229 (.0212)	.1164 (.0224)
Number of Funds in Family			.0001 (.0001)	
Momentum Effects	Yes	Yes	Yes	Yes
Book to Market Effects	Yes	Yes	Yes	Yes
Fund City Effects	Yes	Yes	Yes	Yes
Family Size Effects	No	No	No	Yes

Table 8: The Effect of Fund Size on the Performance of Investments in Local Stocks

The dependent variable is the 4-quarter return to fund investments in local stocks. Small Fund equals one if a fund's size is in the bottom 10% of the fund size distribution and zero otherwise. Small Cap Fund equals one if a fund's Daniel, Grinblatt, Titman and Wermers (1997) small cap style score is in the bottom 10% across funds. Momentum Effects and Book to Market Effects control for other differences in fund styles. Data is from the end of September 1997. Robust standard errors are reported in parentheses.

	(1)	(2)	(3)	(4)
Small Fund	.0258 (.0141)	.0143 (.0152)	.0150 (.0152)	.0116 (.0153)
Small Cap Fund	.1190 (.0145)	.1078 (.0155)	.1079 (.0155)	.1065 (.0156)
Small Fund×Small Cap Fund		.0795 (.0394)	.0776 (.0395)	.0796 (.0398)
Number of Funds in Family			.0002 (.0002)	
Momentum Effects	Yes	Yes	Yes	Yes
Book to Market Effects	Yes	Yes	Yes	Yes
Fund City Effects	Yes	Yes	Yes	Yes
Family Size Effects	No	No	No	Yes