Capacity Constraints and the Opening of New Hedge Funds

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ABSTRACT

We test the hypothesis that capacity constraints significantly influence hedge fund families' decision to open new funds. Hedge fund families face diseconomies of scale because of the non-scalability of their investment strategies. We propose that as the existing funds approach critical size, hedge fund families may prefer opening new funds rather than accepting new investment in the existing funds. Empirically we find that hedge fund families' propensity to open new funds increases with their capacity constraints. Also, a new hedge fund opening is followed by a decrease in fund flows to, and a performance improvement of, the existing funds within the same fund family.

Capacity Constraints and the Opening of New Hedge Funds

Anecdotal evidence suggests that hedge fund managers have a preference to cap, or close, their funds based on the availability of investment opportunities (i.e., experience a capacity constraint) to sustain their superior performance[1]. In this study, we explore if such a capacity constraint might be a major factor motivating hedge fund managers to open new funds. Over the past two decades, hedge funds have become a vital force in the financial landscape[2]. Hedge funds claim to exploit market inefficiencies in its various forms in order to earn abnormal returns for their shareholders. In their quest to beat the market, hedge fund managers adopt various active (and, arguably, risky) portfolio management strategies based on specific events, sectors and market characteristics, as well as, through the use of derivatives.

It should not require much persuasion to establish that hedge funds' likelihood of profitably exploiting market inefficiencies is a decreasing function of their portfolio size. This non-scalability of a typical hedge fund portfolio could be due to endogenous factors such as strategy complexity (Fung and Hsieh, 1997) and a fund manager's skill; or it could be because of exogenous market related factors such as increased competition, low liquidity, and limited profitable opportunities, as suggested by Getmansky (2005) and Zhong (2008). If one accepts this premise, it would be logical to expect a natural limit on the capacity, or size, of any hedge fund portfolio.[3] The extant literature does suggest a negative relationship between size and the performance of hedge funds (see, for example, Getmansky, 2005; Naik, Ramadorai and Stromqvist, 2007; Fung, Hsieh, Naik and Ramadorai, 2008). In that context, we propose that opening new hedge funds may help managers in diverting new fund inflows

from existing funds to new funds and may effectively help in controlling the size of their existing funds.

In this paper we argue that capacity constraints of existing funds can be a determinant for new hedge fund start-ups by fund families. Specifically, we test the following hypotheses: (1) The propensity to open a new fund by a fund family increases with an increase in the capacity constraint experienced by that family; (2) the net fund flow to the existing funds of a family decreases after the introduction of a new fund by the same family; and (3) the performance of existing funds improves after introduction of the new funds. Our research relates to a stream of study that provides evidence that the hedge fund industry experiences a diminishing, and even negative, marginal returns to scale (Goetzmann, Ingersoll and Ross ,2003; Agarwal, Daniel and Naik ,2009; Fung, Hsieh, Naik and Ramadorai ,2007; Zhong, 2008).

We analyze a sample of 9,050 funds, comprising of 3,195 funds of hedge funds (FOF) and 5,855 hedge funds, within the Barclay Hedge Fund database, over the period of 1990 to 2007. We find that the probability of a new hedge fund opening is a positive function of the capacity constraint of the existing funds in the same fund family. We measure a hedge fund's capacity based on excess fund size relative to the average size of funds in a similar strategy category. An analysis of fund flows supports our hypothesis that new funds successfully help in decreasing net fund flows to the existing funds of the same family. We also find that introduction of new hedge funds positively affects the performance of the existing funds within the same family.

It is conceivable that our results could be useful for fund managers and investors alike by mapping a possible pathway of determining the critical size of an existing fund beyond which opening a new fund is more preferable than continuing on with growing an existing fund. In an environment where an increasingly greater proportion of successful fund

managers prefer to limit the inflow of new investments in order to control the growth of their funds beyond a critical size[4], our research provides an objective estimate of that optimal fund size.

Existing research, such as those by Fung, Hseih, Naik and Ramadorai (2008), and Ramadorai (2013), indicates a possible return chasing behaviour among hedge fund investors. These investors are even known for insisting on investing in funds closed for new investments[5]. In that context, our research is able to identify hedge fund strategy categories that could absorb relatively greater fund flows than others without experiencing similar capacity constraints. This could, in turn, help investors avoid chasing returns in an investment category with little, or no, excess capacity.

The paper is organized in five sections. The next section discusses the relevant background literature and proposes the testable hypotheses for this study. Section two provides a description of the data and discusses the variables. Section three analyzes the empirical findings. We provide robustness analyses in section four. Section five concludes the paper.

I. Background Literature

Research in hedge funds has grown exponentially over the past decade. In this paper we aim to connect two distinct research streams: one pertaining to hedge funds' capacity constraints and the other related to decisions regarding new fund opening. Goetzmann, Ingersoll and Ross (2003), Agarwal, Daniel and Naik (2009), Getmansky (2005), Fung, Hsieh, Naik and Ramadorai (2008), Zhong (2008) discuss the issue of capacity constraints for hedge funds. Compared to mutual funds, hedge funds follow a more complex and unorthodox investment strategy. Fung and Hsieh (1997) underscore the point that the active investment management style of hedge funds do not allow them to grow indefinitely without sacrificing performance.

Goetzmann, Ingersoll, Ross (2003) argue that a limit to growth is a typical characteristic of hedge funds which has motivated the hedge fund industry to introduce performance based fee structures for its managers. These authors also argue that most of the hedge fund investment strategies have capacity constraints and, as a result, growth of assets under management beyond a critical point hurts the performance of hedge funds. Therefore, a manager's compensation scheme based on asset size, similar to that prevalent in the traditional mutual fund arena, is not likely to be effective for hedge funds. Goetzmann et al. (2003) also point out that successful funds' unwillingness to accept new monies may indicate a diminishing return in the hedge fund industry. Agarwal, Daniel and Naik (2009) show that hedge funds with greater inflows perform worse in the future. By analyzing fund of funds (FOFs) within the hedge fund industry, Fung, Hsieh, Naik and Ramadorai (2008) report that FOFs that earn abnormal returns, and attract large inflows, are less likely to produce positive abnormal returns in the future. Zhong (2008) finds that fund level inflow has a positive (negative) impact on the future performance of small (large) funds, while inflows at the strategy level are negatively related to future fund performance. These results point to a non-scalability of managers' ability and/ or limited profitable opportunities in the market.

Our research has its origins in Loeb (1983) who reports that the cost of trading in equity markets increases rapidly with decreasing market capitalization of the stock and order size of the transaction. Following in his footsteps, Perold and Salomon (1991) discuss the implications of Loeb's (1983) findings in the context of actively managed funds and analyze the impact of portfolio size on the performance of such funds. They then put forth the intuition that the diseconomies of scale in actively managed funds exist because of higher transaction costs associated with large scale transactions. They argue that, as the rate of return of a fund decreases with increasing fund size, fund managers focus on maximizing

their total dollar returns. They suggest the optimal fund size is a function of a fund's transactional needs and available market liquidity.

Perold (1988) and Perold and Salomon (1991) emphasize the impact of implementation shortfalls, defined as the opportunity cost of unexecuted orders, on portfolio performance. Transaction costs and implementation shortfalls appear to pose significant challenges to active fund managers. For instance, Keim and Madhavan (1997) show that the investment performance of institutional investors depends on their investment strategy as well as on the transaction costs related to the implementation of that strategy. Chen, Hong, Huang, and Kubik (2004) provide empirical evidence of negative scale effects in the managed funds industry. Their findings suggest that the adverse scale effect is more for funds that invest in relatively less liquid stocks. In a typical mutual fund, fund managers are paid a fixed percentage of assets under management as management fee and, therefore, have little incentive for controlling the size of the fund although increased fund sizes may well erode investors' wealth (see, for instance, Perold and Salomon, 1991; Chen et. al., 2004). However, hedge funds' performance based incentive structure aligns fund managers' interests to those of their clients'and ensures that fund managers put a limit to the fund's asset growth (Goetzmann, Ingersoll and Ross, 2003). Therefore, managing fund size is an integral part of hedge funds' performance management. Perold and Salomon (1991) suggest that performance conscious fund managers might as well refuse to accept new investments in their respective funds.

Although prior research has analyzed hedge funds' capacity constraints through fund flow and return relationships, relatively little attention has been paid in exploring whether capacity constraints can affect fund families' decision in starting new hedge funds. In this paper, we explore such a relationship between hedge funds' capacity constraints and fund families' motivation for opening a new hedge fund. We argue that hedge funds face

diseconomies of scale due to the non-scalability of their investment strategies. Consequently, when a hedge fund approaches its optimal size, i.e. when it experiences a capacity constraint, the fund family, rather than allowing the fund to grow beyond its optimal size, can simply choose to start a new fund by diverting incoming fund flows to this new fund. In the existing literature, there are several studies on fund families (see for example Gasper, Massa and Matos, 2006; Massa, 2003; Nanda et al., 2004; Khorana and Servaes, 2007). However, almost none analyze fund families' decision to open new funds. The one exception is Khorana and Serveas (1999) who examine the determinants of new fund opening decisions by mutual fund families. Evans (2010) also performed similar analysis in the context of mutual fund families' incubation strategy. These studies report that fund families' prior performance, size, fee structure and competition are all major factors in determining new fund opening decisions for mutual fund families. One could assume that these factors may also be applicable in the hedge fund context. However, hedge funds are quite different from mutual funds in terms of their investment philosophy, risk characteristics and organizational structure. Therefore, the variables associated with economies of scale and scope may affect the decision to open new hedge funds in a very different way compared to mutual funds.

Based on the extant literature and above discussions, we hypothesize that the fund families' propensity to open a new hedge fund depends on their capacity constraints.

H_1: The propensity to open a new fund by a fund family increases with an increase in the capacity constraint experienced by the fund family.

A fund's capacity constraint maybe defined as the difference between the fund's current size and its optimal size. However, since a fund's optimal size is not observable, we use the average (or median) size of funds within the same strategy class, as a proxy for the optimal fund size. Therefore we measure fund's capacity constraint using excess fund size i.e. as the

difference between the fund size and the average (or median) size of funds within the same strategy class. Finally, we define fund families' capacity constraints, as the largest excess size within the family.[6] Using the largest excess size in a fund family as a proxy for the fund families' capacity constraints allows us to identify the investment strategy of the fund that is experiencing the maximum capacity constraint which, in turn, helps us analyze funds' strategy wise capacity constraints. We discuss this in detail in Section III.A.

We argue that when fund managers experience capacity constraints, they prefer opening new hedge funds in order to divert new fund flows from existing funds. Therefore, the opening of new hedge funds should have a negative impact on the fund flows of existing funds within the family.

We further hypothesize that:

H_2: The net fund flow to the existing funds of a family decreases after the introduction of a new fund by the same fund family.

We further argue that the performance of the existing funds suffers when the funds experience excess capacity constraints. Agarwal, Daniel and Naik (2009); Fung, Hsieh, Naik and Ramadorai (2007); and Zhong (2008), among others, report a negative relationship between fund inflows and fund performance. The opening of new funds may help existing funds divert new fund inflows and also help them avoid growing beyond their critical size. Thus, we would expect a positive impact of new fund opening on the performance of existing funds within the family. Formally:

H_3: The performance of the existing funds improves after the introduction of the new funds.

In the following section we discuss the data and variables used to empirically test our hypotheses.

II. Data and Variables

We employ the Barclay Hedge Fund Database (BHFD) for this study. BHFD is one of the most comprehensive databases for hedge funds. It covers almost 12,000 hedge funds, Commodity Trading Advisors (CTAs), Commodity Pool Operators (CPOs) and hedge fund indices. BHFD provides monthly data on hedge fund returns net of all fees and charges, end of the month assets under management, and other variables including fund domicile, year of inception, parent investment company identifier, details of the fee structure and details of the fund's investment strategy.[7] For the purpose of this study we use hedge fund data over a period of 18 years (1990 to 2007). In our initial sample we have 5550 (3581) active (dead) hedge funds from 3,380 investment companies. Figure 1 shows the distribution of fund domiciles in the data set. The Cayman Islands are the most popular choice for fund domicile in our data with 2,741 funds, followed by the USA with 2,635 hedge funds. Apart from the eight major destinations for fund domicile described in Figure 1, our data also includes funds from 38 other countries across the world. Figure 2 provides details of age distribution for the funds in our data. The mean (median) hedge fund age is 6.8 years (5.8 years) although a typical fund in the dataset is 3.9 years old. For 143 funds in our data, the date of inception is not available.

---------- Insert Figure 1 & 2 here ----------

BHFD claims to report one main and two alternative investment strategies for each fund although, for a majority of the funds, we found that the data on alternative strategies are not available. Therefore we classify the funds based on their main investment strategy. To keep our strategy classification consistent with the previous literature, following Ackermann et al. (1999), Brown et al. (1999) and Brown et al. (2007), we classify all the funds in our

sample in 10 different strategy classes. These strategy classes are: *Emerging Market, Event Driven, Fund of Hedge Funds, Global Macro, Long Only, Multi-strategy, Relative value, Sector Focused, Short Bias, and Others.* There are 60 funds for which strategy details are not available. We exclude these funds form our final sample. In our sample, the two largest strategy categories are *Relative value* with 3,443 funds and funds of hedge funds (*FOFs*) with 3,218 funds. Details of the different investment strategies in our sample are provided in Figure 3. Although we identify 10 different strategy classes in our sample, for strategy wise analysis however, we estimate the propensity of new fund openings for hedge funds with clearly identifiable investment strategies, and do not consider funds with strategy classes such as *Multi-strategy* and *Fund of funds*. We do so to minimize the introduction of confounding effects in the analysis given the "mixed bag" nature of these two strategies. We also do not consider *Short Bias* for the strategy wise estimation of the propensity of new fund opening as there are insufficient observations.[8]Although we do not estimate the capacity constraints for these strategy classes, we do however keep those funds in our sample in order to not lose any potentially valuable information.[9]

----------Insert Figure 3 here ----------

From our initial sample of 9,131 funds we remove 61 as they did not have at least 12 continuous observations of monthly returns. In the final count, we perform our analysis on a sample of 9,050 funds. Table 1 provides a description of hedge fund families included in our sample. This table shows that the number of hedge fund families has increased rapidly during the initial years in our sample; from 1990 to 2002 the average year to year growth rate of number hedge fund families is about 22%; however there is a steady decline in the number of fund families in our sample from 2003 to 2007. In 2002, for example, our sample covers close to 1600 fund families however the number came down to around 1200 by 2007. The average number of funds per family is below 2 until 2001; it increases to 4.7 by 2007. This

table also shows that there is a high proportion (about 66% on average) of single fund families in our sample. However this proportion has decreased over the time from about 78% in 1990 to about 34% in 2007. Consequently the concentration of families with single investment strategy is also quite high (about 89% on average) in the sample. The average number of strategies per family remains less than 1.5 through the entire sample period. Our sample also includes a greater proportion of US fund families compared to non US fund families. Also note that the total number of US fund families and non US fund families does not add up to the total number fund families in the sample since several fund families (about 2% on an average across the sample period) do not report the country of domicile for their hedge funds[10].

---------- Insert Table 1 here ----------

A detailed description of new hedge fund openings across the entire sample period is provided in Table 2. The table shows how many new funds were opened by fund families with a single existing fund; how many were opened by fund families with multiple existing funds; and how many were opened by fund families with multiple existing strategies. Overall, 4,634 new hedge funds were opened by the fund families covered in our sample. Out of these, 1,622 hedge funds were opened by US hedge fund families.

----------Insert Table 2 here ----------

To the best of our knowledge, Khorana and Servaes (1999) and Evans (2010) are the only available research papers on new (mutual) fund opening decisions by fund families. Khorana and Servaes suggest several motivations for introducing new managed funds such as, economies of scale, specialization, competition, etc. However, we are primarily interested in exploring the influence of capacity constraints on new hedge fund openings. In this study, we use the following excess fund size measure to capture fund families' capacity constraints:

$$ExSize\_Avg_{i,t} = \underset{i,t}{Max}\,[\text{AUM of Funds in Family i and Stategy j in year t} - \textit{Mean}\ \text{AUM of Funds in Strategy j in year t}\,] \quad (1)$$

The above capacity constraint variables compare the size of the largest fund in a family against the average size of the funds in the *same strategy category* in order to ascertain the degree of capacity constraint experienced by a given fund family. Similarly, we also calculate the excess size variables based upon the median fund size within a strategy over a given year. As robustness checks we also use other proxies of capacity constraints such as the natural logarithm of excess size variables defined above and the ratio of excess fund size over the mean (or median) fund size of a given strategy class. To test if the fund managers' decision of opening a new hedge fund, in response to capacity constraints, is discrete (rather than a continuous) decision, we also use dummy variable to identify funds that have excess capacity left relative to those that have already crossed their optimum capacity.[11] Based on the excess size variables described above, we also use the construct $Exsize\_Avg\_Dum_{i,t}$ ($Exsize\_Med\_Dum_{i,t}$) – a dummy variable which takes the value 1 when $Exsize\_Avg_{i,t}$ ($Exsize\_Med_{i,t}$) is positive and takes the value 0 otherwise. Since we use hedge fund data from various countries, and over a seventeen (17) year period, we convert all reported fund AUMs in terms of 1990 US dollar values. Nanda, Wang and Zheng (2004) show that there is a significant spillover effect from better performing funds to the other funds of the fund family in terms of attracting more fund flows. Gaspar et al. (2006) provides evidence of cross subsidisation among same family funds. Therefore size, fund flows and the performance of existing funds might significantly influence the new fund introduction decision of the fund families. Khorana and Servaes (1999) and Evans (2010) use family and strategy level size, fund flow and performance variables in explaining new introduction of new funds. Goetzmann et al. (2003) emphasize the importance of fee structures in explaining hedge fund performance and risk taking behaviour. The hedge funds' ability to employ leverage in their

investment strategies is a fundamental difference between hedge funds and traditional mutual funds. According to Fung and Hsieh (1999), hedge fund strategies along with their use of leverage are factors that determine investors' choice of hedge funds. Following the existing literature, in our analysis, we use several control variables related to hedge funds, fund families, fund strategies and the market. These variables include *family size, strategy size, family performance, strategy performance, family fund flow, strategy fund flow, family fee structure, leverage, number of funds introduced by competitors*, etc. We also use dummy variables to control for the strategy of the new fund and the strategies of the largest fund in the family. As larger fund families tend to have larger sized funds, there is a high correlation between total assets under management of the fund family and the excess fund size variables defined earlier. Therefore, in order to better control for the size effects of the fund families in our analysis, we use the variable *residual fund family size* which we define as follows:

$$\begin{bmatrix} Rsd\_Familysize\_Avg_{i,t} \\ Rsd\_Familysize\_Med_{i,t} \end{bmatrix} = S \times \ln \begin{vmatrix} e_{i,t} \\ u_{i,t} \end{vmatrix} \tag{2}$$

Where S takes the value -1 if $e_{i,t}$ or $u_{i,t}$ is negative otherwise S is +1, where $e_{i,t}$ and $u_{i,t}$ are the residuals of the following regression equation.

$$Fundfamily\_AUM_{i,t} = a + b\begin{bmatrix} Exsize\_Avg_{i,t} \\ Exsize\_Med_{i,t} \end{bmatrix} + \begin{bmatrix} e_{i,t} \\ u_{i,t} \end{bmatrix} \tag{3}$$

A detailed description of the variables used is provided in Table A1 in Appendix 1. The summary statistics are reported in Table 3. In our sample, over the period 1990 through 2007, the average fund family size is about $27.5 million, although the largest fund family has about $32.35 billion invested in their portfolios. The annual average excess return of all the fund families is about 3.2%. While this is small, it is not unexpected, as the excess return is calculated based on industry median fund returns. We use the MSCI hedge fund index returns as a proxy for market returns. Over the sample period, the average market return is

11.22%. There are, on average, about 49 new funds introduced every year in each strategy category over the sample period. Over the years, the average number of funds in each strategy category is about 254. However, in the initial years, some of the categories have very few funds while, in 2007, there are 2,393 FOFs in our sample.

III. Analyses

A. Propensity of New Fund Opening

We argue that capacity constraints experienced by hedge fund families encourage the fund managers to open new funds. Empirically we measure fund families' capacity constraints using excess size variables such as: $ExSize\_Avg_{i,t}$, $ExSize\_Med_{i,t}$ and others as described in the previous section. The larger the value of the excess fund size, the greater is the constraint. Figure 4 plots the average number of new hedge funds opened by fund families in various excess fund size quintiles. These figure show that fund families in the upper quintiles opened new hedge funds at a greater frequency , on average, compared to families in the lower quintiles. This observable trend supports our basic hypothesis that capacity constraint motivates fund managers to open new hedge funds.

We further use a pooled binary regression model to investigate the impact of capacity constraints on the decision to open new funds by the fund families. The dependent variable is a binary variable representing the decision of the fund family *i* to open a new hedge fund with investment strategy *j* in the year *t*. In our empirical analysis, we use the following Probit model:

$$Probit\left(\theta_{i,j,t}\right) = \alpha + \gamma_1 ExSize_{i,t-1} + \sum_{1}^{k} \beta_k x_k \qquad (4)$$

where $\theta_{i,j,t}$ is the probability of a new fund opening in strategy *j* by family *i* in year *t*. The dependent variable takes the value 1 if the investment company *i* opened a new fund in

strategy class *j* during period *t*; otherwise, it takes the value 0. $ExSize_{i,t}$ refers to the excess size variables defined above. The variable x_k is a vector of (*k*) control variables related to fund family, fund strategy and other fund and market characteristics.

In hypothesis H_1, we argue that hedge fund families may prefer opening new funds when their existing funds experience a capacity constraint. We estimate Equation (4) to test this hypothesis. Table 4 reports estimated coefficients from the Probit model described in Equation (4). Model 1 and Model 3 in Table 4 report the coefficients estimated from the binary Probit models where $ExSize\_Avg\_Dum_{i,t}$ and $ExSize\_Med\_Dum_{i,t}$ are used as the proxies for capacity constraints, whereas Model 2 and Model 4 use $ExSize\_Avg_{i,t}$ and $ExSize\_Med_{i,t}$ respectively.

---------- Insert Table 4 here ----------

The results of the Probit estimation presented in Table 4 show that capacity constraints appear to have a positive and significant impact on the propensity to open new hedge funds. The coefficients of the excess fund size proxies are positive and significant at the 1% level in all models reported in Table 4. This supports our hypothesis H_1 that the probability of new fund opening increases with an increase in the excess fund size relative to the largest fund of the family. In these models we also control for other possible factors that might influence a new hedge fund opening such as those that capture market share, seize opportunities in well performing strategies, attract new investors through past performance, display positive market conditions and high investor demand. We find that large fund families display a greater propensity to open new funds since *Rsd_Fundsize_Med* and *Rsd_Fundsize_Avg* both have positive and significant coefficients. Our results suggest that

fund families are more inclined to open hedge funds in larger and better performing strategy classes as the coefficients of $Log\ (Strategy\_AUM)_{t-1}$ and $(Strategy\_Exret)_{t-1}$ are positive and significant. We find that fund families with higher management and incentive fees are more inclined to open new hedge funds and that the probability of new fund opening increases when the largest fund within the family uses leverage. However, variables such as past performance of the fund family, net fund flow to the family, and net fund flow to the strategy, are not significant in explaining new fund opening decisions. Even market return is found to be insignificant in explaining the decision to open new hedge funds. Interestingly, we find that the propensity to open a new hedge fund increases when fund families open new hedge funds in the strategy class similar to the strategy of the largest fund within the family. At first blush, this may sound counter intuitive as it may mean that fund families prefer opening new funds in the strategy class in which they experience capacity constraints. However, as we use relatively broad strategy classifications, our findings could also be interpreted as hedge fund families preferring to specialize in their respective successful strategies instead of diversifying.[12] This evidence falls well in line with the findings of Boyson (2008) who reports that hedge fund families open new funds in the area of their core competencies in order to increase their market share. In the results reported in Table 4, we find evidence that fund families tend to follow their competitors as we find that fund families follow industry trends in that there is higher probability of opening a new fund in the strategy class that attracts a greater number of new funds over the previous year. However, when opening new funds, fund families appear to avoid those strategy categories that have more funds in favor of strategies that have fewer funds, as the probability of new fund opening is negatively correlated to the number of existing funds in the any strategy class.

The Probit model described in Equation (4) estimates the average sensitivity of the fund families' propensities to open new hedge funds with respect to their capacity constraints.

However, the extant literature (Getmansky, 2005; Teo, 2009) generally discusses hedge funds' capacity constraints with respect to their specific investment strategies and the underlying liquidity of the market where the fund invests. Therefore, it is reasonable to expect that some strategies may experience greater capacity constraints than others. Hence, we estimate the strategy wise influence of capacity constraints on fund families' decision to open new funds. We estimate the following Probit model that tests for the fund families' strategy-wise sensitivity to capacity constraints.

$$Probit\left(y_{i,j,t}\right) = \alpha + \sum \gamma_j Strategy\_Dum_j \times ExSize_{i,t-1} + \sum \beta_k x_k \quad (5)$$

The variables $Strategy\_Dum_j$ are dummy variables indicating the strategy of the fund families' largest funds which are most likely to suffer from capacity constraints. As discussed earlier, for our analysis, we focused on six different hedge fund strategies: *Emerging Market (EM), Event Driven (ED), Global Macro (GM), Long Only (LO), Relative Value (RV) and Sector Focused (SF)*. Other variables remain the same as described earlier.

Table 5 reports the estimated coefficients of the Probit models described in Equation (5). These results are quite similar to the findings reported in Table 4. In these models, we introduce an interaction term between the excess fund size variables and the strategy dummy, thereby focusing on capacity constraints of the funds in the investment strategy classes among the largest funds of the families.

---------- Insert Table 5 here ----------

Overall, we find that the coefficients of most of the interaction variables are positive and highly significant. However, in some of the models, the coefficients associated with the *Long Only* categories are statistically insignificant and, hence, insignificantly distinct from zero. Therefore with the exception of the *Long Only* strategy categories, in all other strategy

classes, we find very strong evidence of capacity constraint influencing new hedge fund opening decisions.[13] The results of Table 4 and 5 strongly support our hypothesis H_1 that capacity constraint significantly influences new fund opening decisions of fund families.

B. Critical Fund Size

The results reported in Table 4 and 5 allow us to find the critical fund size beyond which the fund families are more inclined to open a new hedge fund rather than continuing on with the existing funds. Figure 5 plots the probability of a new fund opening with the increase in the excess fund size of the largest fund in the family. Figure 5 is based on the estimated coefficients of Model 2 in Table 5. The figure shows how the probability of a new fund opening varies with the strategy of the largest fund in the family. It shows that *Sector Focused* funds reach their capacity much faster than other strategy classes. This figure also reflects no capacity constraint for the *Long Only* category. Intuitively this makes sense as *Sector Focused* funds generally invest in less liquid markets compared to funds in the *Global Macro* and *Long Only* strategies.

Figures 6 and 7 compare critical fund sizes across the various strategies. We define the critical size of a fund as the fund size at which the likelihood of new fund opening by a given fund family crosses 50%. Figure 6 reports that, in dollar value terms, funds with a *Global Macro* strategy appear to have the highest capacity. However, Figure 7 shows that, relative to the average fund size in the different strategy categories, in our sample, funds in *Emerging Market* and *Event Driven* strategy category have more room for growth compared to *Global Macro* or *Sector Focused* funds.[14]

C. Fund Flows and New Fund Opening

The basic argument behind hypothesis H_1 is that, while experiencing capacity constraints, fund families open new hedge funds in order to divert new fund flows from existing funds to the new fund. Therefore, in H_2, we test if fund flows to the existing funds decreases after the introduction of new funds by the same fund family. For testing H_2, we analyze the net fund flow of the largest existing fund in the fund families. We calculate the net fund flow to the hedge funds following Sirri and Tufano (1998) as:

$$Dollar\ Fund\ Flow_t = AUM_t - AUM_{t-1}(1+R_t) \tag{6}$$

$$Fund\ Flow\ Rate_t = \frac{Dollar\ Fund\ Flow_t}{AUM_{t-1}} \tag{7}$$

where, AUM_t is the end of the month asset under management and R_t is the monthly return of a hedge fund. Following previous literature (see, for instance, Sirri and Tufano,1998 ; Fung, Hsieh, Naik and Ramadorai, 2007) we model fund flows based on past performance, fund size and market conditions. In these models, we also include dummy variables to identify pre-new fund introduction period as well as the post-new fund opening period. Our pooled regression models to test *H2* are as follows:

$$Fund\ FlowRate_{i,t} = a + b_1 Pre\_NewFamFund_{i,t} + b_2 Post\_NewFamFund_{i,t} + \sum c_i y_i \tag{8}$$

$$\log(Dollar\ Fund\ Flow_{i,t}) = a + b_1 Pre\_NewFamFund_{i,t} + b_2 Post\_NewFamFund_{i,t} + \sum c_i y_i \tag{9}$$

where $Pre\_NewFamFund$ ($Post\_NewFamFund$) is a dummy variable which takes the value one if the fund family of hedge fund *i* introduced at least one new hedge fund within the next (previous) one year i.e. within the period *t* to *t*+12 (*t*-12 to *t*) months. Other

independent variables are represented by the vector y_i. A detailed description of those variables is provided in Table A2 of Appendix 1.

Table 6 reports the results of a pooled regression models described in (8) and (9). We find the coefficient estimates of the pooled regression are consistent with hypothesis *H2*. Model 1 uses net fund flow as a dependent variable. In this model, the coefficients of *Pre_NewFamFund* and *Post_NewFamFund* dummies are both positive and significant. However, the value the coefficient of *Post_NewFamFund* is smaller than that associated with *Pre_NewFamFund* which supports the hypothesis that, fund flows to the existing fund decreases following a new fund opening. Statistical analysis shows that the difference between the size of these two coefficients is statistically significant.

---------- Table 6 Here ----------

Model 2 uses the natural logarithm of the dollar value of fund flows as the dependent variable. Table 6 reports that fund flows are positive and significant both before and after new fund openings. However, similar to the previous analysis for fund flow rates, the coefficient of the dummy variable for the post-new fund opening period is smaller relative to the coefficient of the dummy for the pre-new fund opening period. Tests confirm that this difference is statistically significant. This result supports *H2* and provides evidence that opening new hedge funds could be a strategic choice by the fund managers in order to divert new fund flows away from existing funds

.

D. Abnormal Return and New Fund Opening

Finally we also investigate if the strategy of opening new hedge funds to divert new fund flows from the existing fund helps in improving the performances of existing funds. We

calculate the abnormal fund performance, or the alpha of the hedge funds, using the following the seven (7) factor model proposed by Fung and Hsieh (2004). A similar factor model is also used by Fung et al. (2007).

$$R_{f,t} = \alpha + \beta_1 SNPMRF_t + \beta_2 SCMLC_t + \beta_3 BD10RET_t + \beta_4 BAAMTSY_t + \beta_5\ PTFSBD_t + \beta_6 PTFSFX_t + \beta_7\ PTFSCOM_t \quad (10)$$

R_f is the monthly hedge fund return for fund *f* and month *t*. The set of factors comprises the excess return on the S&P 500 index (*SNPMRF*); a small minus big factor (*SCMLC*) constructed as the difference of the Wilshire small and large capitalization stock indices; the yield spread of the US 10-year treasury bond rate over the three month T-bill rate, adjusted for the duration of the ten year bond (*BD10RET*); and the change in the credit spread of the Moody's BAA bond over the 10-year treasury bond, also appropriately adjusted for duration (*BAAMTSY*). The other factors are based on primitive trend following strategies discussed by Fung and Hsieh (2001). These are: excess returns on portfolios of look-back straddle options on currencies (*PTFSFX*), commodities (*PTFSCOM*) and bonds (*PTFSBD*), which are constructed to replicate the maximum possible returns to trend-following strategies on their respective underlying assets[15].

We estimate the factor model for all the hedge funds using the first 60 months of their return history. Based on the estimated parameters of the seven factor model, we calculate the monthly alphas of the funds for rest of the sample period as follows:

$$Alpha_{i,t} = R_{i,t} - (\hat{\beta}_{i,1} SNPMRF_t + \hat{\beta}_{i,2} SCMLC_t + \hat{\beta}_{i,3} BD10RET_t + \hat{\beta}_{i,4} BAAMTSY_t + \hat{\beta}_{i,5}\ PTFSBD_t + \hat{\beta}_{i,6} PTFSFX_t + \hat{\beta}_{i,7}\ PTFSCOM_t\ ) \quad (11)$$

Where, $\hat{\beta}_{i,j}$ refers to the estimated parameters from Eq. (10) for hedge fund *i*.

Finally, we use the following pooled regression model to investigate the potential impact of a new fund opening decision on the performance of the other funds in the same family as:

$$Alpha_{i,t} = \lambda + \delta_1 Pre\_NewFamFund_{i,t} + \delta_2 Post\_NewFamFund_{i,t} + \sum \theta_k y_k \qquad (12)$$

where $Pre\_NewFamFund$ and $Post\_NewFamFund$ are dummy variables as described earlier, y_k is a vector of (k) control variables. A description of these control variables are provided in Table A2 of Appendix 1.

Table 7 reports the estimated coefficients of the pooled regression model described in Eq. (12). We find that the abnormal performances of the largest funds are positively and significantly different in both the pre and post periods of new fund openings, we also find that the coefficient of the post new fund opening dummy is larger than the pre new fund opening dummy which would again suggest an improvement in fund performance following the opening of a new fund by the family. The performance improvement is about 4% per annum. Tests confirm the statistical significance of the performance improvement of the existing funds after the opening of a new fund by the same fund family. This result supports H_3 and indicates that the strategy of opening a new hedge fund in order to divert fund flows from existing funds to newly introduced funds is an economically rewarding exercise.

---------- Table 7 Here ----------

IV. Robustness Checks

A. Alternative Excess Size Measure, Sub Strategy and Time Dummies

Following our definition of capacity constraint in Section III, we use dollar value of excess fund size (defined in Eq.(1)) in our empirical analyses. However these excess size measures could be criticized for being unscaled or absolute measures. To ensure the

robustness of our empirical findings, we also measure the capacity constraint using various scaled version of our original excess size measures. In this robustness check, we use excess fund size as a fraction of the mean and median fund size within a strategy class. This definition provides a relative measure of capacity constraint with respect to the mean or median of the fund size in any specific strategy class. Specifically, we define alternative excess fund size measures as follows:

$$ExSize\_AvgR_{i,t} = \underset{i,t}{Max}\left[\frac{\text{AUM of Funds in Family i and Stategy j in year t}}{Mean\ \text{AUM of Funds in Strategyj in year t}}\right] \quad (13)$$

$$ExSize\_MedR_{i,t} = \underset{i,t}{Max}\left[\frac{\text{AUM of Funds in Family i and Stategy j in year t}}{Median\ \text{AUM of Funds in Strategyj in year t}}\right] \quad (14)$$

Table 8 shows the results of Probit models for estimating the propensity of new fund opening using these alternative capacity constraint measures. We find that most of the coefficients of excess fund sizes are positive and highly significant in all of the models. However the coefficients of the interaction between *Long Only* strategy and the alternative excess fund size variables are positive but insignificant. These results are consistent with our initial findings reported in Table 4 and reconfirm our hypothesis H_1 that the capacity constraints faced by fund families positively influence their decisions to open new funds.

---------- Table 8 Here ----------

Following the arguments of the previous robustness test, we also use the natural logarithm of $ExSize\_Avg_{i,t}$ and $ExSize\_Med_{i,t}$ to define another scaled version of our original proxies of capacity constraints. In Table 9, we report the estimated coefficients of the Probit model described in Equations (4) and (5) with these alternative excess size proxies. These models include dummies for investment sub strategies within the broad strategy

classes. The sub strategies refer to actual investment strategies reported by the funds. The sub strategy dummy takes the value 1 if fund families open new funds in the investment sub strategies similar to that of the largest fund of the family, and takes the value 0 otherwise. Our sample covers about seventeen years of data. Although, in our initial analysis, we control for time varying market conditions with the help of the market return variable, we do not include any explicit year dummies. In the models reported in Table 9 we also included year dummies in order to explicitly control for year specific fixed effects. The results reported in Table 9 are qualitatively similar to our earlier findings, as excess size variables are positive and significant in most of the models. The sub strategy dummy is also found to be positively related to the propensity of new fund opening which confirms our conjecture as stated in Section III.A.

---------- Table 9 Here ----------

B. Evidence from Large and Small Fund Families

In our analysis, we argue that fund families decide to open new funds when their largest funds experience a capacity constraint. However our sample includes very small fund families (the smallest one has about $100,000 asset under management) as well as very large fund families (largest family has $32B asset under management); the average family size in the sample is $192M but the upper quartile of family size is only about $106.75M, this indicates the existence of few very large fund families. Therefore, to check if our results are driven by the few fund families with very large hedge funds, we partition our sample into sub samples of “large fund family” and “small fund family”. The large fund family sub sample includes the fund families whose largest funds are within the largest 25% of the funds in their

respective strategy class. Similarly, the small fund family sub sample is defined by the fund families with their largest funds within the smallest 25% of the funds in their respective strategy class. The results of this analysis are presented in Table 10 and 11 and are consistent with our earlier findings. We find that the capacity constraint measure is positively related to probability of new fund opening not only in large fund families but also in small families. However, based on the estimated models in Table 11, the probability of a new fund opening in our small fund family sub sample never exceeds beyond 25%. On the other hand, for our large fund family sub sample, the estimated probability of a new fund opening goes well beyond the 50% mark. Therefore, the size of the funds in the small fund families are well below their critical fund sizes, although that is not the case for the large fund families.

---------- Table 10 & Table 11 ----------

C. Evidence from Fund Families with One Fund, Families with Many Funds and Multiple Strategies

As we mentioned earlier, one of the basic assumptions of our empirical analysis is that the largest fund (i.e. fund with largest excess fund size) within the family is the one that is most likely to experience a capacity constraint. However, this assumption is moot for single fund families that are deciding to open their second fund and presents us with a natural experiment to test for the robustness of our basic hypothesis without imposing the mentioned assumption. Accordingly, we partition our sample into three sub samples as: 1) Fund families with a single fund (SFF) deciding to open their second fund; 2) Fund families with multiple funds focused in a single strategy class (MFSS) deciding to open a new fund; and 3) Fund families with multiple funds and multiple strategies (MFMS). In general, the results of this analysis are consistent with our main findings[16]. We find evidence in support of our

hypothesis H_1 in all three sub samples; however for SFF sub sample $ExSize\_Avg_{i,t}$ and $ExSize\_Med_{i,t}$ are found to be insignificant in predicting probability of new fund opening though both $ExSize\_Avg\_Dum_{i,t}$ and $ExSize\_Med\_Dum_{i,t}$ are positive and significant as per our expectation. For the other two sub samples, MFSS and MFMS, the results are similar to our original analysis. The implication is that, similar to fund families with multiple funds, those families with a single hedge fund do not proactively decide to open new hedge funds as their existing fund's size increases; however, the probability of their opening a new hedge fund increases as their existing funds cross their respective critical values. This could mean that families with multiple funds are more concerned and/or aware of their capacity constraints relative to single fund families. Overall, the general consistency in results across these subsamples suggests that our original findings do not depend on the assumption regarding identification of existing funds experiencing capacity constraints.

D. Evidence from US and Non US Fund Families

In the past, non US / offshore hedge funds have attracted particular attention in hedge fund research (see, for example, Brown, Goetzmann, and Ibbotson, 1999; Liang 1999 & 2000, Liang and Park, 2008). The offshore hedge funds are typically registered in small islands off the Caribbean, Europe and Asia Pacific. These funds operate in a very different regulatory and institutional environment; they often enjoy different legal structure, tax advantages and face lesser regulations compared to US hedge funds. Brown, Goetzmann, and Ibbotson (1999) report a positive risk adjusted performance of offshore funds although they do not find any differential managerial skills in these funds. They are generally riskier compared to onshore funds (Liang, 1999) but provide similar returns relative to the US-based hedge funds. According to Liang and Park (2008), onshore funds impose stricter liquidity

restrictions on investors compared to offshore funds due to tax and other legal differences. They also find that offshore funds provide higher illiquidity premiums to their investors through a stronger correlation between asset illiquidity and share illiquidity. Therefore, the regulatory and institutional differences between US and non US domiciled funds may motivate their trading style and portfolio choices. It may well be worthwhile investigating if capacity constraints are important in new fund opening decisions of the non US fund families. To do so, we create a sub sample of the US and Non-US fund families. We find that the results are qualitatively similar to our original results[17], implying that the influence of capacity constraints on fund families' decisions to open new hedge funds may well be a global phenomenon. Over all, we find that all our robustness analyses provide strong support of our main findings.

V. Summary and Conclusions

The extant literature suggests that hedge funds experience capacity constraints and provides evidence of a non-scalability of hedge funds' investment strategies (Goetzmann, Ingersoll and Ross ,2001; Fung, Hsieh, Naik and Ramadorai ,2007; Zhong, 2008; Teo, 2009). In this paper, we argue that capacity constraints faced by hedge fund families might well explain the decision to open new hedge funds by the hedge fund families. We argue that portfolio managers may find that it difficult to actively manage large portfolios with complex investment strategies. Therefore, for active funds, the returns should be a concave function of fund size. Consequently, fund managers may restrict existing fund sizes to an optimal threshold level by diverting new incoming funds from investors to a newly created hedge fund within the same family. We find strong empirical evidence supporting our hypotheses.

Using hedge fund data for a period of seventeen years (1990 through 2007) from the Barclay Hedge Fund Database, we find that fund families' propensity to open a new hedge fund increases with an increase in the excess fund size of the extant largest fund within a hedge fund family. We estimate the critical fund sizes beyond which fund families prefer opening new hedge funds relative to continuing to grow their existing funds. Our results show that funds that invest in relatively liquid markets suffer less from capacity constraints. Strategies such as *Global Macro* and *Long Only* enjoy greater capacities compared to the *Sector Focused* hedge funds. We also find evidence that fund inflows to the existing funds increase before the introduction of new funds and they subsequently decrease following the opening of the new hedge funds. This supports our contention that capacity constraints may influence new hedge fund opening decisions by the hedge fund families. Finally, we find that the performance of the existing funds of the family increases following the opening of a new fund. Thus, the strategy of diverting fund flows from existing funds to a new hedge fund helps fund families improve their performance overall.

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Appendix A

Table A1

Variable Description for Probit Models.

This table provides description of the variables used for estimating fund families' propensity of opening new hedge funds. The empirical Probit models that use these variables are described in Equation 4 and 5. Table 4, 5, 8, 9, 10, 11 reports the estimated coefficients from the Probit models using these variables.

Variable	Description
$(Family\_ExAvgret)_{t-1}$	Cross sectional average of annual return of funds in a family minus median annual return of the hedge fund industry
$(Family\_fundfow)_{t-1}$	Sum of annual net fund flow to all the funds in a family. Net fund flow is calculated following Sirri and Tufano (1998).
$(Strategy\_AUM)_{t-1}$	Natural logarithm of total asset under management of all the funds in a strategy class.
$(Strategy\_ExAvgret)_{t-1}$	Cross sectional average of annual return of funds in a strategy minus median annual return of the hedge fund industry
$(Strategy\_Fundflow)_{t-1}$	Sum of annual net fund flow to all the funds in a strategy class. Net fund flow is calculated following Sirri and Tufano (1998).
Rsd_Familysize_Avg	Residual fund family size after controlling for correlation with Exsize_Avg.
Rsd_Familysize_Med	Residual fund family size after controlling for correlation with Exsize_Med.
High _Mgmt_Fee	Dummy variable which takes the value 1 if average management fee for the fund family is higher than the industry

	average
High_Incentive_Fee	Dummy variable which takes the value 1 if average incentive fee for the fund family is higher than the industry average
Leverage_Largest	Dummy variable indicates if largest fund of the family uses leverage
$(Strategy\_No\_of\_new\_funds)_{t-1}$	Number of new funds introduced in a strategy class
$(Strategy\_Total\_No\_of\_funds)_{t-1}$	Total number of funds in a strategy class
Market_Return	Annual return on MSCI hedge fund index
Similar_Strategy	Dummy variable which takes the value 1 if fund family opens new fund in same strategy class of the largest existing fund of the family
Different_Sub_Strategy	Dummy variable which takes the value 1 if fund family opens new fund in different sub strategy class compared to that of the largest existing fund of the family
Strategy Dummies (*EM* = Emerging Markets, *ED* = Event Driven, *GM* = Global Macro, *LO* = Long Only, *RV* = Relative Value and *SF* = Sector Focused)	Dummy variables indicating strategy of the largest fund in the family for the year.
ExSize *ExSize_Avg* , *ExSize_Med* , *ExSize_Avg_Dum*, *ExSize_Med_Dum*, *ExSize_AvgR* *ExSize_MedR*	Excess fund size variables. Equations 1, 13 & 14 define various Exsize variables used in the analysis.
Strategy Dummies x *ExSize*	Interaction between strategy dummy and excess fund size variables.

Table A2

Variable description for Fund flow and Abnormal return analysis.

This table provides description of variables used to in empirical analysis of fund flows and abnormal returns of the hedge funds around a new fund opening by the fund family. The regression models that use these variables are described in Equation 8, 9 & 12. Table 6 & 7 reports the estimated coefficients from the models that use these variables.

Variables	**Description**
AUM_t-1	End of the month asset under management.
Alpha_t-1	Abnormal return calculated using 7 factor model proposed by Fung and Hsieh (2001), Fung,Hsieh, Naik and Ramadorai (2007). Using monthly hedge fund return and factor data, the parameters of the 7 factor model are estimated over a period of 5 years. The monthly alphas are then calculated for the rest of the sample period using estimated parameters.
Market_ret_t-1	Market return. Monthly return on MSCI hedge fund index.
US_Domicile_Dum	Dummy variable takes the value one if the fund is United States.
Boom1_Dum	Dummy variable indicating boom period of 2000 - 2001 based on economic cycles identified by NBER. The dummy variable takes value one for 6 months period ending on March 2001.
Boom2_Dum	Dummy variable indicating boom period of 2007 based on economic cycles identified by NBER. The

	dummy variable takes value one for 6 months period ending on December 2007.
Rec_Dum	Dummy variable indicating recession period of 2001 based on economic cycles identified by NBER. The dummy variable takes value one for 6 months period ending on November 2001.
Strategy Dummies	Dummy variable for different hedge fund strategy classes.

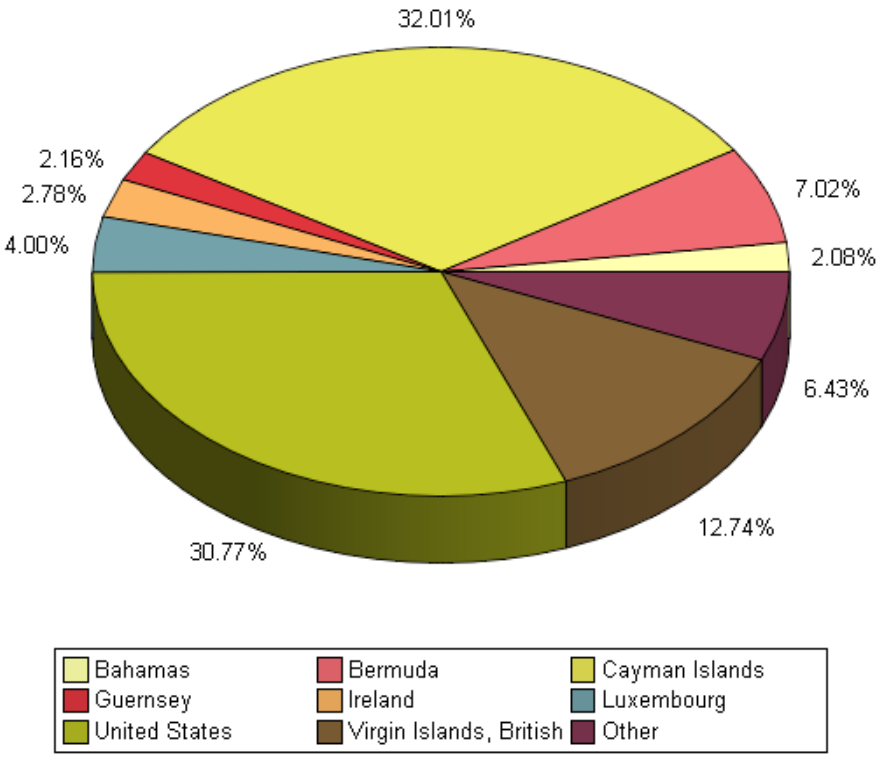

Figure 1: Hedge funds' country of domicile - This figure provides break-up of the hedge fund sample used in this study according the funds' domicile.

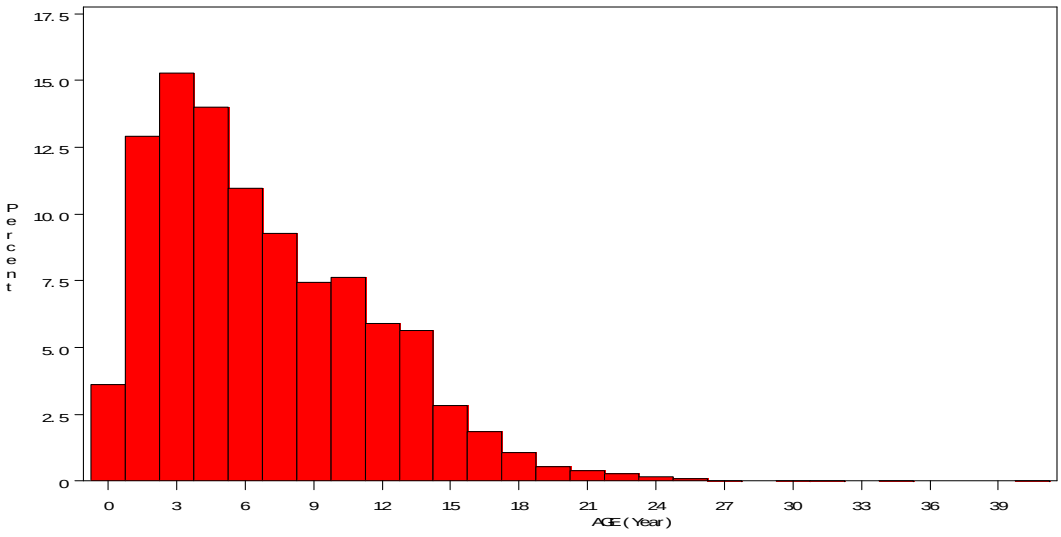

Figure 2: Distribution of age of the hedge funds in the sample.

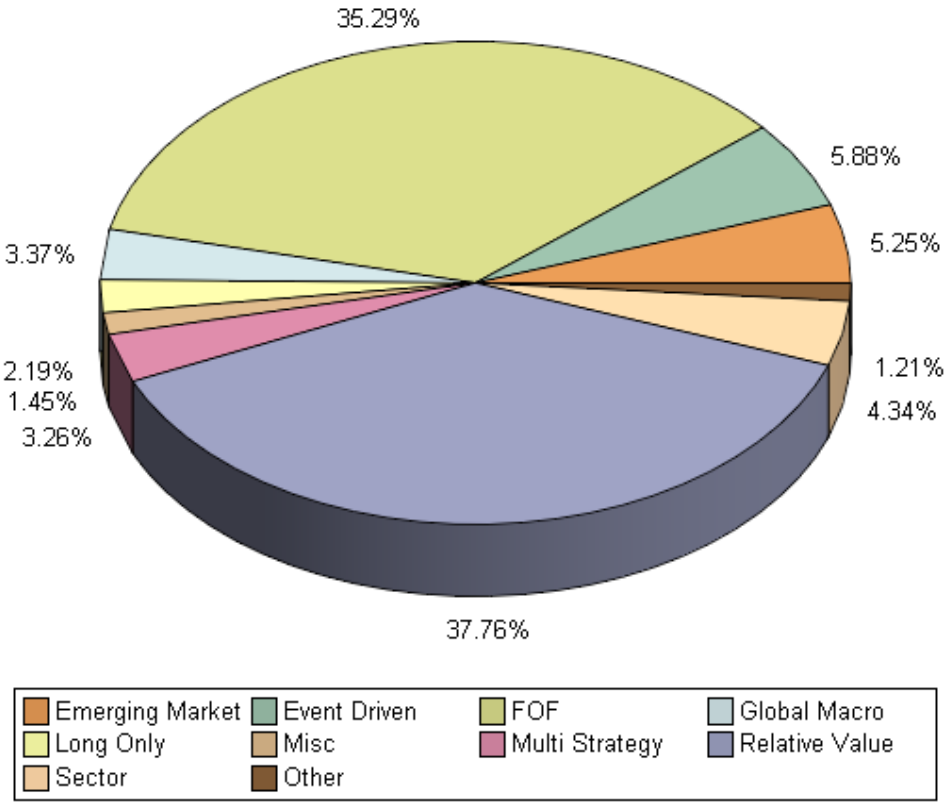

Figure 3: Investment Strategies of Hedge Funds included in the sample. This figure provides break-up of the hedge fund sample used in this study according the funds' investment strategy.

Table 1: Description of Hedge Fund Families

This table provides year wise details of fund families included in the sample used in this study across the sample period.

Year	No of Fund Families	Average No. of Funds per Families	Average Asset Under Management (US $ Bn.)	No. of Single Fund Families	No. Families with 5 or more Funds	Fund Families with one Strategy	Average No. of Strategies per Family	No. of US Fund Families	No. of Non US Fund Families
1990	155	1.465	0.077093	121	4	138	1.129	96	54
1991	234	1.419	0.079492	186	6	215	1.094	146	82
1992	327	1.431	0.081987	255	10	302	1.089	200	116
1993	490	1.384	0.099511	391	12	458	1.078	290	185
1994	722	1.404	0.100651	583	18	676	1.075	407	292
1995	905	1.425	0.085681	721	26	842	1.081	513	372
1996	1061	1.473	0.095267	828	32	989	1.079	591	449
1997	1257	1.522	0.108278	958	42	1171	1.080	716	525
1998	1404	1.564	0.099951	1053	54	1297	1.093	799	587
1999	1489	1.652	0.111775	1082	69	1370	1.102	854	616
2000	1516	1.783	0.11248	1052	91	1380	1.117	854	640
2001	1549	1.986	0.122432	1018	128	1402	1.129	863	663
2002	1573	2.219	0.134864	945	142	1403	1.150	881	666
2003	1567	2.559	0.20154	878	192	1366	1.177	870	664
2004	1514	3.097	0.307443	767	233	1289	1.211	848	625
2005	1382	3.840	0.383944	569	280	1119	1.271	775	564
2006	1298	4.411	0.445793	468	313	1014	1.326	710	544
2007	1178	4.677	0.580718	406	288	911	1.337	638	512

Table 2: New Fund Openings by Hedge Fund Families

This table provides year wise information on new hedge fund introduction by fund families in the sample of this study. New fund opening statistics are provided for the entire sample and also for sub samples of funds families with single fund, multiple funds and single strategy, multiple funds with multiple strategies and US based fund families.

	Single Fund Families		Multiple Fund Single Strategy Families		Multiple Fund Multiple Strategy Families		All Fund Families		US Families	
Year	**Opened at least one new fund**	**Number of Funds Opened**	**Opened at least one new fund**	**Number of Funds Opened**	**Opened at least one new fund**	**Number of Funds Opened**	**Opened at least one new fund**	**Number of Funds Opened**	**Opened at least one new fund**	**Number of Funds Opened**
1991	6	6	1	1	4	4	11	11	6	6
1992	18	19	3	6	5	9	26	34	12	13
1993	16	19	4	5	5	7	25	31	12	15
1994	23	29	17	29	8	18	48	76	29	37
1995	35	40	18	30	12	15	65	85	38	42
1996	41	60	25	38	11	16	77	114	40	51
1997	45	60	29	41	20	37	94	138	45	57
1998	39	45	32	49	21	30	92	124	55	67
1999	46	63	37	65	29	48	112	176	52	67
2000	43	51	44	72	32	67	119	190	66	99
2001	50	61	68	158	39	107	157	326	78	113
2002	66	91	74	139	49	129	189	359	92	144
2003	51	69	111	232	61	179	223	480	96	151
2004	56	79	136	379	77	266	269	724	117	225
2005	64	81	135	330	83	277	282	688	125	234
2006	37	56	113	268	88	290	238	614	95	185
2007	29	39	92	189	66	236	187	464	63	116
Total		868		2031		1735		4634		1622

Table 3: Descriptive Statistics

This table reports descriptive statistics of variables in used in this study over the sample period of 1990 to 2007. The asset under management (*Family_AUM , Strategy_AUM)* and excess fund size (*Exsize_Avg,* Exsize_Med) variables are reported in terms of 1990's million US dollar, excess returns (*Family_Exret, Strategy_Exret),* market return (*Market_Ret),* fund flows (,*Family_Fundflow, Strategy_Fundflow)* are reported as fractions and number of funds (*Strategy_No_of_new_funds , Strategy_Total_No_of_funds)* are reported as absolute numbers. For detail variable descriptions please refer to table A1 in Appendix 1.

Variable	Mean	Std Dev	Minimum	Maximum	Median
Family_AUM ($Mn)	192	788	0.1017	32500	28.22
Family_Exret	0.0202	0.2010	-2.383	2.4467	0.0049
Family_Fundflow	0.6264	4.3881	-1.7403	407.3829	0.0941
Strategy_AUM ($Mn)	15800	31900	1.8781	177000	3950
Strategy_Exret	0.0219	0.0924	-0.3848	0.2875	0.0227
Strategy_Fundflow	0.2109	0.5571	-0.6842	5.4393	0.1251
Market_Ret	0.1021	0.1676	-0.1743	0.3151	0.1083
Strategy_No_of_new_funds	49.1464	80.6365	0	437	18
Strategy_Total_No_of_funds	254.6196	444.6527	1	2393	89
Exsize_Avg ($Mn)	23.8245	321	-440	14000	-38
Exsize_Med ($Mn)	83.9861	326	-190	14200	3.2022

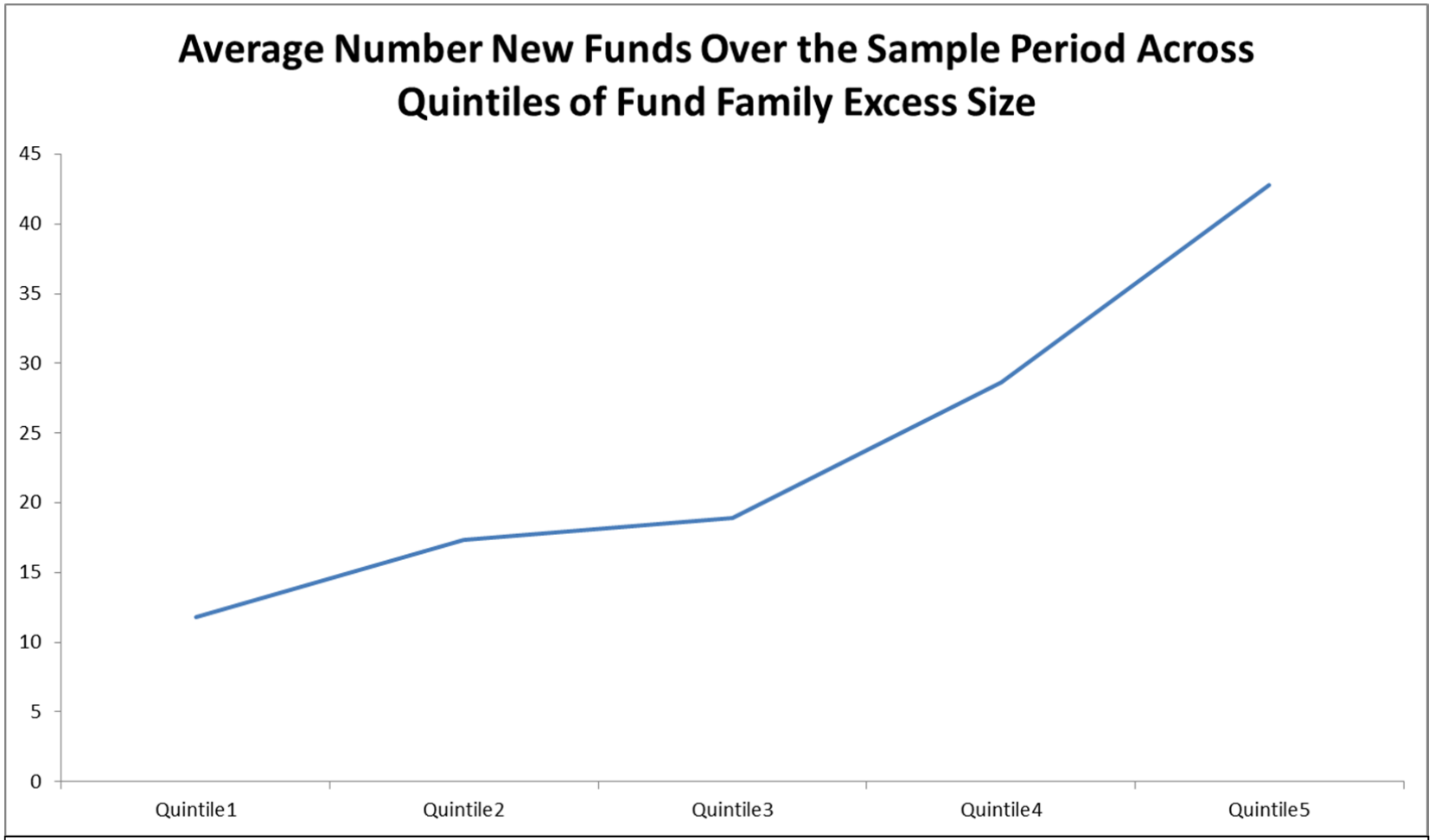

Figure 4: This figure shows the average number of new hedge funds opened per year over the sample period by the fund families in various excess size quintiles.

Table 4
Propensity of New Fund Opening

This table reports estimated coefficients and their standard errors from the Probit regression model described in Equation 4 of Section III. The sample of the study is hedge funds included in Barclay's Global Hedge Fund database, over the sample period of 1990 to 2007. The dependent variable is a dummy variable which takes the value 1 if fund family opens a new hedge fund in a specific strategy category in a particular year within the sample period, and it takes the value zero (0) otherwise. The independent variables are fund family's previous year's excess return, fund flow and size ($(Family\_Exret)_{t-1}$, $(Family\_fundflow)_{t-1,}$ *Rsd_Familysize_ Avg Rsd_Familysize_Med respectively)*. Other independent variables are, natural logarithm of fund strategy category's previous year's asset under management $Log(Strategy\_AUM)_{t-1}$, previous year's excess return and fund flow to the strategy category ($(Strategy\_Exret)_{t-1,}$ $(Strategy\_Fundflow)_{t-1}$ respectively); dummy variable identifying new funds with strategy similar to the largest fund of the family (*Similar_Strategy)*, dummy variable identifying use of leverage by the largest fund of the family, dummy variables identifying if the largest fund's management fees and incentive fees are above industry median (*High _Mgmt_Fee, High_Incentive_Fee*), number of new funds opened in the previous years in a strategy class ($(Strategy\_New\_funds)_{t-1}$), total number of funds in a strategy class ($(Strategy\_No\_of\_funds)_{t-1}$). The proxy of capacity constraints used in these models are excess fund size variables (*Exsize_Avg*) as defined in Equation 1, we also use excess size measure based on industry median fund sizes (*Exsize_Med*). We also use dummy variables (*Exsize _Avg_Dum* , *Exsize _Med_Dum*) based on excess size variables to identify fund families' capacity constraints as discussed in Section III. Detail description of all the variables are provided in Table A1 in Appendix 1. This table also provides the pseudo R^2 s of the Probit models estimated. The 1%, 5% level of statistical significance of the coefficients are indicated using ***and ** respectively.

	Model 1		Model 2		Model 3		Model 4	
	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.
Intercept	-5.7295***	0.3064	-5.5139***	0.3024	-5.891***	0.3073	-5.5957***	0.3043
$(Family\_Exret)_{t-1}$	0.0758	0.0688	0.0511	0.0661	0.0623	0.0692	0.0669	0.0661
$(Family\_fundflow)_{t-1}$	0.00649	0.00423	0.00854**	0.00412	0.00674*	0.00415	0.00871**	0.0041
$Log(Strategy\_AUM)_{t-1}$	0.1263***	0.0134	0.1231***	0.0132	0.1257***	0.0134	0.1252***	0.0133
$(Strategy\_Exret)_{t-1}$	0.3785**	0.1921	0.3997**	0.1902	0.3908**	0.1928	0.417**	0.1912
$(Strategy\_Fundflow)_{t-1}$	-0.00959	0.0495	-0.0104	0.0487	0.0036	0.0482	0.00207	0.0477
Similar_Strategy	1.1945***	0.0269	1.1737***	0.0266	1.1993***	0.027	1.178***	0.0266

Leverage_Largest	0.0982***	0.0274	0.1041***	0.0272	0.0844***	0.0275	0.1034***	0.0272
Market_Return	0.0687	0.0727	0.0621	0.0724	0.0502	0.0724	0.0705	0.0718
High _Mgmt_Fee	0.1552***	0.025	0.1804***	0.0246	0.1612***	0.025	0.1839***	0.0247
High_Incentive_Fee	0.2705***	0.0268	0.3086***	0.0266	0.283***	0.0269	0.3037***	0.0266
$(Strategy\_New\_funds)_{t-1}$	0.00221***	0.000204	0.00218***	0.000204	0.00216***	0.000203	0.00209***	0.000202
$(Strategy\_No\_of\_funds)_{t-1}$	-0.000286***	0.000041	-0.000275***	0.000041	-0.000276***	0.000041	-0.000263***	0.000041
Rsd_Familysize_Avg	0.00882***	0.000789	0.00777***	0.000784				
Rsd_Familysize_Med					0.0125***	0.000787	0.00911***	0.000752
Exsize _Avg_Dum	0.4479***	0.0249						
Exsize _Med_Dum					0.5082***	0.0299		
Exsize_Avg			0.0332***	0.0244				
Exsize_Med							0.312***	0.0239
Strategy Dummies	Yes		Yes		Yes		Yes	
Pseudo R^2	0.3152		0.3036		0.3185		0.3064	

Table 5

Propensity of New Fund Opening (Investment Strategy wise)

This table reports estimated coefficients and their standard errors from the Probit regression model described in Equation 5 of Section III. The sample of the study is hedge funds included in Barclay's Global Hedge Fund database, over the sample period of 1990 to 2007. The dependent variable is a dummy variable which takes the value 1 if fund family opens a new hedge fund in a specific strategy category in a particular year within the sample period, and it takes the value zero (0) otherwise. The independent variables are fund family's previous year's excess return, fund flow and size (*(Family_Exret)$_{t-1}$, (Family_fundflow)$_{t-1,}$ Rsd_Familysize_ Avg Rsd_Familysize_Med respectively)*. Other independent variables are, natural logarithm of fund strategy category's previous year's asset under management *Log(Strategy_AUM)$_{t-1}$* , previous year's excess return and fund flow to the strategy category (*(Strategy_Exret)$_{t-1,}$ (Strategy_Fundflow)$_{t-1}$* respectively); dummy variable identifying new funds with strategy similar to the largest fund of the family (*Similar_Strategy)*, dummy variable identifying use of leverage by the largest fund of the family, dummy variables identifying if the largest fund's management fees and incentive fees are above industry median (*High _Mgmt_Fee, High_Incentive_Fee*), number of new funds opened in the previous years in a strategy class (*(Strategy_New_funds)$_{t-1}$*), total number of funds in a strategy class (*(Strategy_No_of_funds)$_{t-1}$*). The proxy of capacity constraints used in these models are excess fund size variables (*Exsize_Avg*) as defined in Equation 1, we also use excess size measure based on industry median fund sizes (*Exsize_Med*). We also use dummy variables (*Exsize _Avg_Dum , Exsize _Med_Dum*) based on excess size variables to identify fund families' capacity constraints as discussed in Section III. The models estimated in this table uses interaction between largest funds' investment strategies and their excess fund sizes as independent variables. Detail description of all the variables are provided in Table A1 in Appendix 1. This table also provides the pseudo R^2 s of the Probit models estimated. The 1%, 5%, 10% level of statistical significance of the coefficients are indicated using ***, ** and * respectively.

	Model 1		Model 2		Model 3		Model 4	
Excess size proxies	Exsize_Avg_Dum		Exsize_Avg		Exsize_Med_Dum		Exsize_Med	
	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.
Intercept	-5.6004***	0.3084	-5.5077***	0.3032	-5.5673***	0.3075	-5.5536***	0.3046
(Family_Exret)$_{t-1}$	0.0878	0.0696	0.0581	0.0668	0.0644	0.0696	0.0782	0.067
(Family_fundflow)$_{t-1}$	0.00699*	0.0042	0.0082**	0.00416	0.00712*	0.00414	0.00832**	0.00414
Log(Strategy_AUM)$_{t-1}$	0.1287***	0.0135	0.1229***	0.0133	0.1262***	0.0135	0.1242***	0.0134
(Strategy_Exret)$_{t-1}$	0.3744**	0.1928	0.4139**	0.1909	0.4063**	0.1933	0.4264**	0.192
(Strategy_Fundflow)$_{t-1}$	-0.0141	0.0506	-0.00835	0.0486	0.00285	0.0484	0.0015	0.0481

Similar_Strategy	1.2045***	0.027	1.1793***	0.0266	1.2012***	0.027	1.1865***	0.0267
Leverage_Largest	0.0874***	0.0276	0.1135***	0.0275	0.0778***	0.0276	0.111***	0.0275
Market_Return	0.0621	0.0733	0.0715	0.0725	0.0487	0.0726	0.0819	0.0721
High _Mgmt_Fee	0.1581***	0.0251	0.1644***	0.0249	0.164***	0.0251	0.1643***	0.025
High_Incentive_Fee	0.2714***	0.027	0.2989***	0.0267	0.2813***	0.027	0.2888***	0.0268
$(Strategy\_New\_funds)_{t-1}$	0.00223***	0.000205	0.00222***	0.000204	0.00215***	0.000203	0.00217***	0.000203
$(Strategy\_No\_of\_funds)_{t-1}$	-0.000291***	0.000041	-0.00028***	0.000041	-0.000271***	0.000041	-0.000274***	0.000041
Rsd_Familysize_Avg	0.00927***	0.000796	0.00758***	0.000789				
Rsd_Familysize_Med					0.0129***	0.000793	0.00926***	0.000759
*lrgEM*exsize*	0.2276***	0.0855	0.325*	0.198	0.4304***	0.0993	0.316*	0.196
*lrgED*exsize*	0.4961***	0.0853	0.367***	0.118	0.5854***	0.1034	0.367***	0.117
*lrgGM*exsize*	1.045***	0.1458	0.255***	0.0407	0.9249***	0.1999	0.208***	0.0413
*lrgLO*exsize*	0.9838***	0.237	0.0225	0.251	0.7572***	0.2885	-0.00873	0.266
*lrgRV*exsize*	0.6233***	0.0398	0.618***	0.0542	0.6478***	0.0471	0.647***	0.0539
*lrgSF*exsize*	0.1221	0.0906	1.41***	0.244	0.3015***	0.0985	1.41***	0.235
Strategy Dummies	Yes		Yes		Yes		Yes	
Pseudo R^2	0.3204		0.3071		0.3205		0.3107	

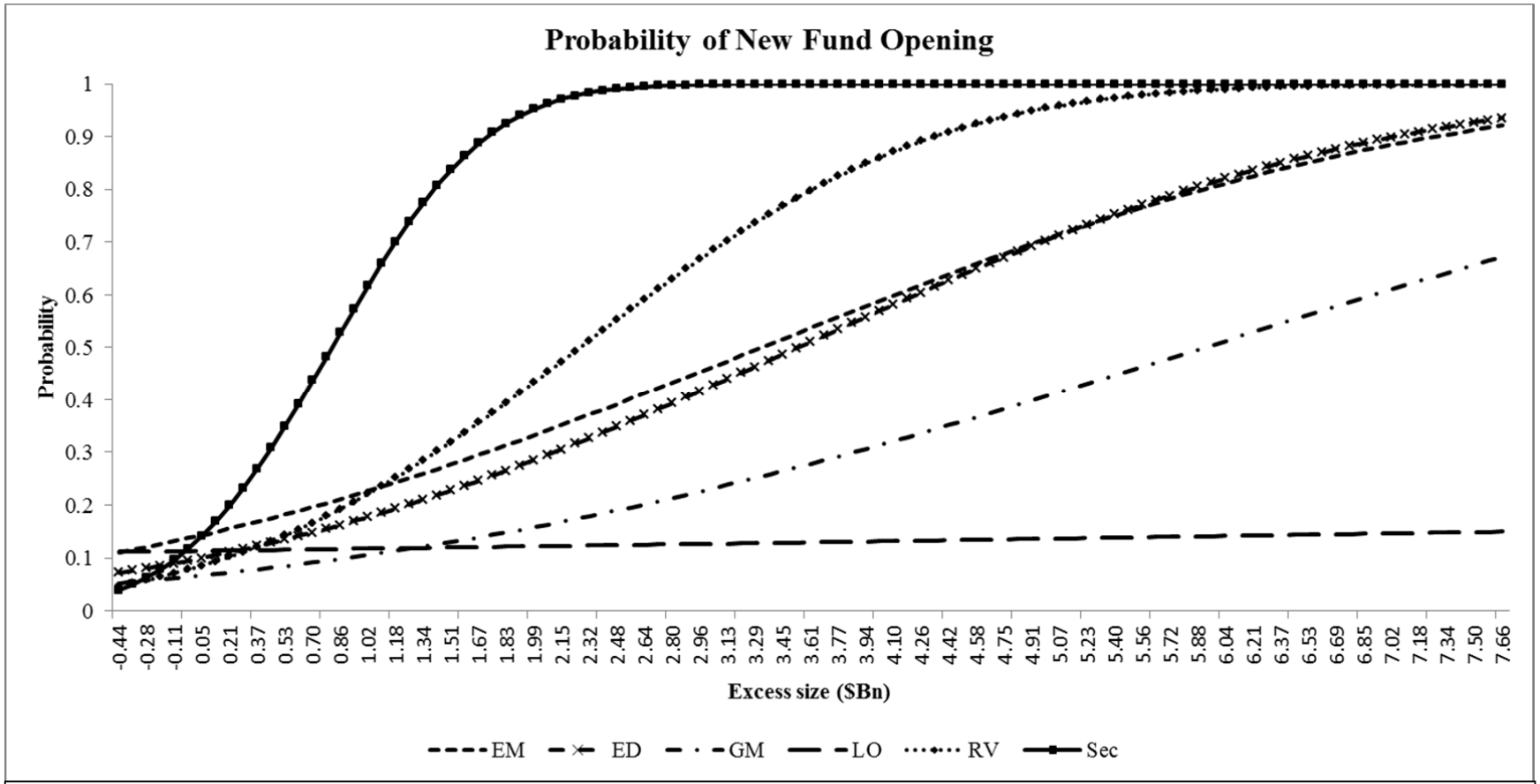

Figure 5: Probability of new fund opening across different investment strategy categories.
This figure shows how probability of new hedge fund opening increases as excess fund size (proxy of capacity constraints) increases in various investment strategy categories. The probabilities of new fund opening are estimated using the estimated coefficients of the Model 2, reported in Table 5.

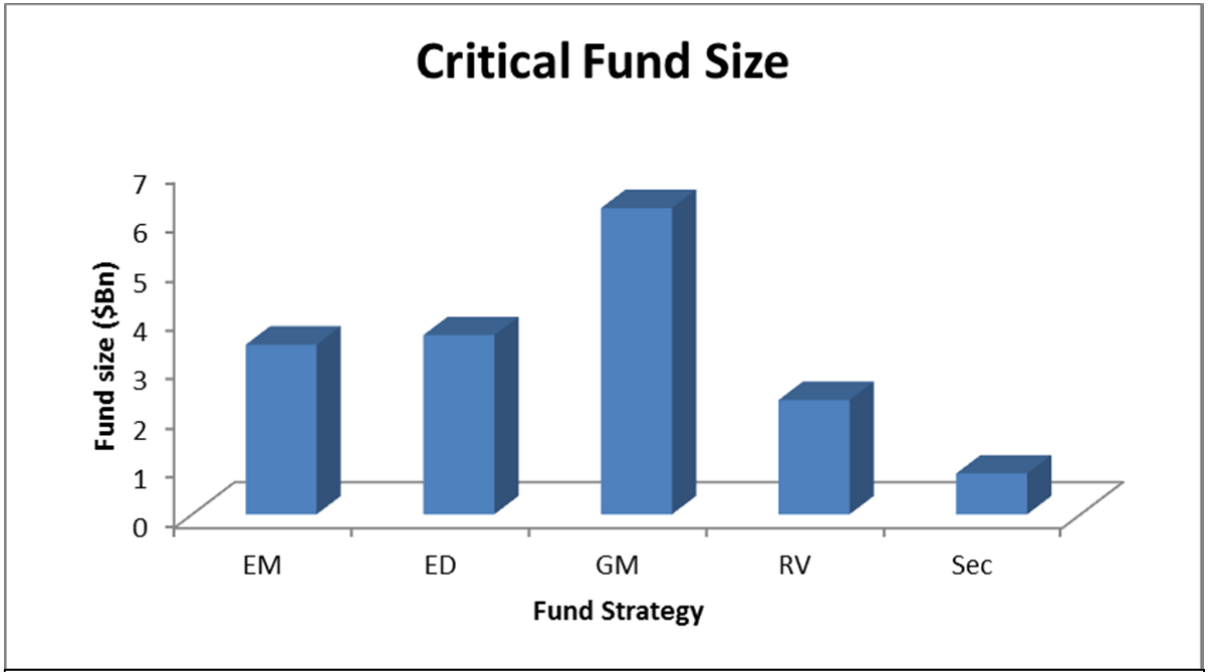

Figure 6: Critical fund size for different strategy categories – This figure plots estimated critical size of hedge funds with different investment strategies. The critical fund size represents the (approx) asset under management value beyond which the probability of openning a new fund is greater than 50%.

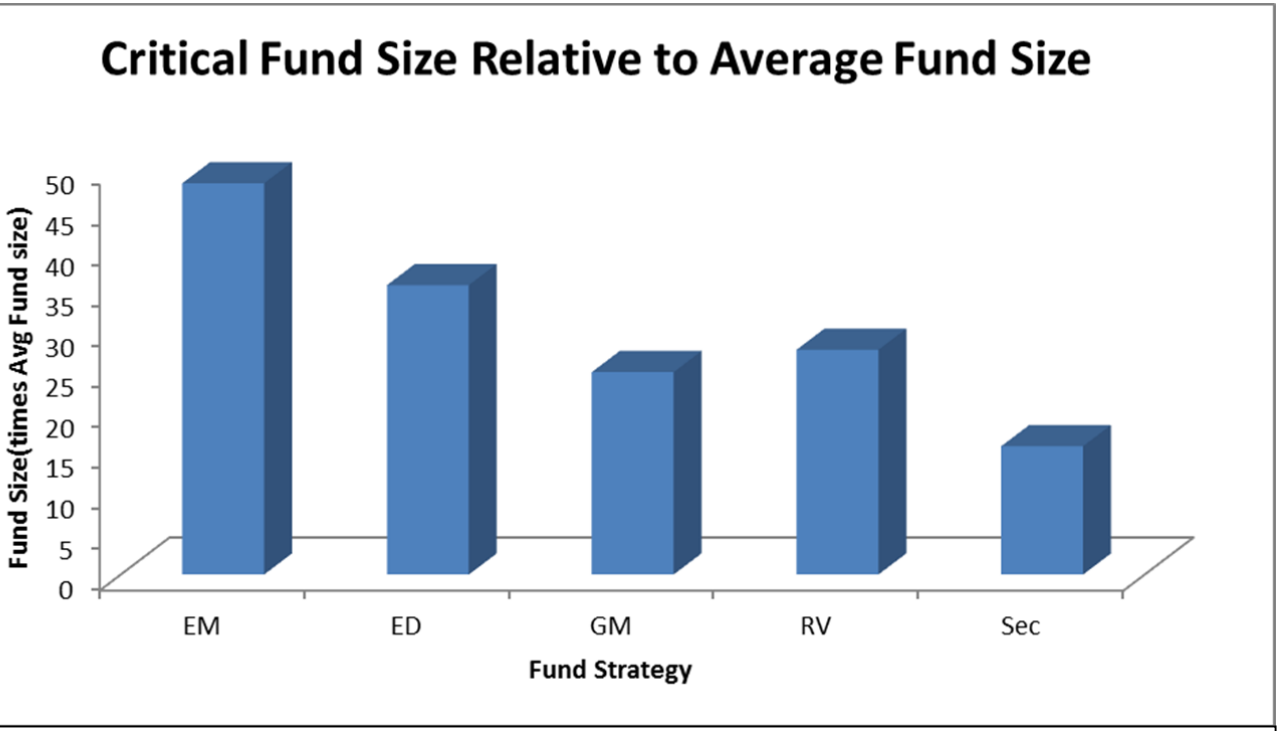

Figure 7: Critical fund size relative to avegare fund sizes in different strategy categories. .
Based on Figure 5, this figure plots the ratio of estimated critical sizes of hedge funds with different investment strategies over the average fund sizes in respetive strategy categories.

Table 6
New Fund Opening and Fund Flow to Existing Funds

This table shows the how new fund opening decisions affect fund flows to the existing hedge funds of the same fund family. It reports estimated regression coefficients and standard errors from the models described in Equation 8 and 9. The sample of the study is hedge funds included in Barclay's Global Hedge Fund database, over the sample period of 1990 to 2007. The dependent variable is the monthly fund flows to the largest fund of the family. The independent variables includes past year's asset under management, performance and market return (*AUM_t-1*, *Alpha_t-1*, *Market_ret_t-1*, respectively). Dummy variables to identify pre new fund opening period and post new fund opening period (*Pre_NewFamFund* , *Post_NewFamFund*); dummy variables to identify fund investment strategies and economic cycles : booms and recession. The variables of these models are described in details in table A2 in Appendix A. The adjusted R^2 of the models are also reported in the table. This table also reports the F statistics for testing the hypothesis: Coefficient of *Pre_NewFamFund* < Coefficient of *Post_NewFamFund* . The 1%, 5% and 10% level of statistical significance are indicated using ***, ** and * respectively.

	Model 1		**Model 2**	
	Fund Flow Rate		**Log(Dollar Fund Flow)**	
Variable	**Coefficient**	**Standard Error**	**Coefficient**	**Standard Error**
Intercept	0.11875***	0.0042	-11.52896***	0.21032
AUM_t-1	-0.00605***	0.22378×10^{3}	0.65027***	0.0112
Alpha_t-1	0.00336*	0.00194	1.2638***	0.09734
Market_ret_t-1	0.07071***	0.00895	5.85955***	0.44799
Pre_NewFamFund	0.01158***	0.00123	1.09818***	0.06157
Post_NewFamFund	0.00806***	0.00114	0.28129***	0.05728
US_Domicile_Dum	-0.00644***	0.74946×10^{3}	0.76121***	0.03752
Boom1_Dum	-0.00312	0.0022	-0.03201	0.11028

Boom2_Dum	0.00105	0.00153	-0.03796	0.07651
Rec_Dum	0.003**	0.00144	0.32118***	0.07216
Strategy Dummies	Yes		Yes	
Adj R^2	0.0017		0.0112	
Hypothesis Test: Coefficient of *Pre_NewFamFund* > Coefficient of *Post_NewFamFund*				
F value	5.01**		107.98***	

Table 7
New Fund Opening and Performance of Existing Funds.

This table shows the how new fund opening decisions affect performance to the existing hedge funds of the same fund family. It reports estimated regression coefficients and standard errors from the model described in Equation 12. The sample of the study is the hedge funds included in Barclay's Global Hedge Fund database, over the sample period of 1990 to 2007. The dependent variable is the monthly abnormal return earned (*Alpha*) by the largest fund of the family. The seven factor model proposed by Fung et al (2007) described in Equation (10) is used to estimate abnormal performance of the hedge funds. The independent variables includes logarithm of past year's asset under management, past year's fund performance and past year's market return (*Log*(*AUM_t-1*), *Alpha_t-1, Market_ret_t-1,* respectively). Dummy variables to identify pre new fund opening period and post new fund opening period (*Pre_NewFamFund* , *Post_NewFamFund*); dummy variables to identify fund investment strategies and economic cycles : booms and recession. The variables of these models are described in details in table A2 in Appendix A. The adjusted R^2 of the model is also reported in the table. This table also reports the F statistics for testing the hypothesis: Coefficient of *Pre_NewFamFund* < Coefficient of *Post_NewFamFund* . The 1%, 5% and 10% level of statistical significance are indicated using ***, ** and * respectively.

Variable	**Coefficients**	**Standard Error**
Intercept	0.0093***	0.00309
Log(AUM_t-1) x 10^2	-0.11***	0.016299
Alpha_t-1	0.35648***	0.00138
Market_ret_t-1	0.21689***	0.00652
Pre_NewFamFund	0.00067771	0.00090987
Post_NewFamFund	0.00393***	0.00082513
US_Domicile_Dum	0.01237***	0.0005532
Boom1_Dum	-0.0695***	0.00161
Boom2_Dum	-0.05599***	0.00098673

Rec_Dum	-0.00205*	0.00109
Strategy Dummies	Yes	
Adj R^2	0.1663	
Hypothesis Test: Coefficient of *Pre_NewFamFund* < Coefficient of *Post_NewFamFund*		
F Value	7.25***	

Table 8

Robustness Check A – Propensity of New Fund Opening with Alternative Excess Fund Size Measures.

This table reports estimated coefficients and their standard errors from the Probit regression model described in Equation 4 and 5 of Section III. The sample of the study is hedge funds included in Barclay's Global Hedge Fund database, over the sample period of 1990 to 2007. The dependent variable is a dummy variable which takes the value 1 if fund family opens a new hedge fund in a specific strategy category in a particular year within the sample period, and it takes the value zero (0) otherwise. The independent variables are fund family's previous year's excess return, fund flow and size ($(Family\_Exret)_{t-1}$, $(Family\_fundflow)_{t-1,}$ *Rsd_Familysize_ Avg Rsd_Familysize_Med respectively)*. Other independent variables are, natural logarithm of fund strategy category's previous year's asset under management $Log(Strategy\_AUM)_{t-1}$, previous year's excess return and fund flow to the strategy category ($(Strategy\_Exret)_{t-1,}$ $(Strategy\_Fundflow)_{t-1}$ respectively); dummy variable identifying new funds with strategy similar to the largest fund of the family (*Similar_Strategy)*, dummy variable identifying use of leverage by the largest fund of the family, dummy variables identifying if the largest fund's management fees and incentive fees are above industry median (*High _Mgmt_Fee, High_Incentive_Fee*), number of new funds opened in the previous years in a strategy class ($(Strategy\_New\_funds)_{t-1}$), total number of funds in a strategy class ($(Strategy\_No\_of\_funds)_{t-1}$). The proxy of capacity constraints used in these models are excess fund size variables ($Exsize\_AvgR_{t-1}$) as defined in Equation 13, we also use excess size measure based on industry median fund sizes ($Exsize\_MedR_{t-1}$) as defined in Equation 14. Model 3 & 4 estimated in this table uses interaction between largest funds' investment strategies and their excess fund sizes as independent variables. Detail description of all the variables are provided in Table A1 in Appendix 1. This table also provides the pseudo R^2 s of the Probit models estimated. The 1%, 5% level of statistical significance of the coefficients are indicated using ***and ** respectively.

	Model 1		Model 2		Model 3		Model 4	
Exsize variables	$Exsize\_AvgR_{t-1}$		$Exsize\_MedR_{t-1}$		$Exsize\_AvgR_{t-1}$		$Exsize\_MedR_{t-1}$	
	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.
Intercept	-5.529***	0.3033	-5.6217***	0.3051	-5.5507***	0.3045	-5.5978***	0.306
$(Family\_Exret)_{t-1}$	0.0531	0.0662	0.064	0.0658	0.0506	0.0667	0.0661	0.0666
$(Family\_fundflow)_{t-1}$	0.00799**	0.00414	0.00825**	0.00411	0.00824**	0.00415	0.00798**	0.00414
$Log(Strategy\_AUM)_{t-1}$	0.1235***	0.0133	0.1259***	0.0134	0.1247***	0.0133	0.1259***	0.0134
$(Strategy\_Exret)_{t-1}$	0.4136**	0.1898	0.4369**	0.1906	0.4196**	0.1903	0.4421**	0.1913
$(Strategy\_Fundflow)_{t-1}$	-0.00382	0.0475	0.00858	0.0463	-0.00379	0.0475	0.00853	0.0463
Similar_Strategy	1.1696***	0.0265	1.1688***	0.0265	1.1728***	0.0265	1.1751***	0.0265

Leverage_Largest	0.1045***	0.0272	0.1101***	0.0272	0.1102***	0.0274	0.1068***	0.0274
Market_Return	0.0754	0.0721	0.0766	0.0714	0.0726	0.0723	0.0812	0.0716
High _Mgmt_Fee	0.1664***	0.0248	0.1869***	0.0246	0.168***	0.0249	0.1689***	0.0249
High_Incentive_Fee	0.3045***	0.0265	0.3063***	0.0266	0.3018***	0.0267	0.298***	0.0267
$(Strategy\_New\_funds)_{t-1}$	0.00212***	0.000203	0.00199***	0.000201	0.00212***	0.000203	0.00202***	0.000202
$(Strategy\_No\_of\_funds)_{t-1}$	-0.000259***	0.000041	-0.000239***	0.00004	-0.000261***	0.000041	-0.000244***	0.000041
Rsd_Familysize_Avg	0.0075***	0.000784			0.00753***	0.000788		
Rsd_Familysize_Med			0.00886***	0.000752			0.0092***	0.00076
$Exsize\_Avg_{t-1}$	0.0313***	0.0026						
$Exsize\_Med_{t-1}$			0.00442***	0.000435				
$lrgEM*Exsize\_AvgR_{t-1}$					0.0181	0.017	0.00535	0.00413
$lrgED*Exsize\_AvgR_{t-1}$					0.0431***	0.0128	0.0157***	0.0043
$lrgGM*Exsize\_AvgR_{t-1}$					0.061***	0.0101	0.00276***	0.000661
$lrgLO*Exsize\_AvgR_{t-1}$					0.0132	0.0194	0.00232	0.00327
$lrgRV*Exsize\_AvgR_{t-1}$					0.0446***	0.00443	0.0105***	0.00117
$lrgSF*Exsize\_AvgR_{t-1}$					0.0618***	0.0173	0.0303***	0.00642
Strategy Dummies	Yes		Yes		Yes		Yes	
Pseudo Rsq	0.3023		0.3032		0.3044		0.3066	

Table 9

Robustness Check A– Propensity of New Fund Opening
(Dummy variable for fund sub-strategies, year fixed effects and using alternative excess fund size measures)

This table reports estimated coefficients and their standard errors from the Probit regression model described in Equation 4 and 5 of Section III. Models estimated in this table are similar to models estimated in Table 8, except for the fact that in these models we control for sub categories of funds investment strategies using a dummy variable - *Different_Sub_Strategy*, and we also control for year fixed effects. Also these models use natural logarithm of *Exsize_Avg* and natural logarithm of *Exsize_Med* as excess fund size measure. The sample of the study is hedge funds included in Barclay's Global Hedge Fund database, over the sample period of 1990 to 2007. The dependent variable is a dummy variable which takes the value 1 if fund family opens a new hedge fund in a specific strategy category in a particular year within the sample period, and it takes the value zero (0) otherwise. The independent variables are fund family's previous year's excess return, fund flow and size (*$(Family\_Exret)_{t-1}$, $(Family\_fundflow)_{t-1}$, Rsd_Familysize_ Avg Rsd_Familysize_Med respectively)*. Other independent variables are, natural logarithm of fund strategy category's previous year's asset under management *$Log(Strategy\_AUM)_{t-1}$* , previous year's excess return and fund flow to the strategy category (*$(Strategy\_Exret)_{t-1}$, $(Strategy\_Fundflow)_{t-1}$* respectively); dummy variable identifying new funds with strategy similar to the largest fund of the family (*Similar_Strategy)*, dummy variable identifying use of leverage by the largest fund of the family, dummy variables identifying if the largest fund's management fees and incentive fees are above industry median (*High _Mgmt_Fee, High_Incentive_Fee*), number of new funds opened in the previous years in a strategy class (*$(Strategy\_New\_funds)_{t-1}$*), total number of funds in a strategy class (*$(Strategy\_No\_of\_funds)_{t-1}$*). Model 3 & 4 estimated in this table uses interaction between largest funds' investment strategies and their excess fund sizes as independent variables. Detail description of all the variables are provided in Table A1 in Appendix 1. This table also provides the pseudo R^2 s of the Probit models estimated. The 1%, 5% and 10% level of statistical significance of the coefficients are indicated using ***, ** and * respectively.

	Model 1		Model 2		Model 3		Model 4	
$Exsize_{t-1}$ Variables	*$Log(Exsize\_Avg_{t-1})$*		*$Log(Exsize\_Med_{t-1})$*		*$Log(Exsize\_Avg_{t-1})$*		*$Log(Exsize\_Med_{t-1})$*	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Intercept	-7.1184***	0.4011	-7.2526***	0.4032	-7.2044***	0.4031	-7.2189***	0.404
$(Family\_Exret)_{t-1}$	0.0972	0.0817	0.1068	0.0816	0.1008	0.0821	0.1029	0.0818
$(Family\_fundflow)_{t-1}$	0.00844*	0.00486	0.00851*	0.00491	0.00841*	0.00487	0.00855*	0.00493
$Log(Strategy\_AUM)_{t-1}$	0.1701***	0.0168	0.1717***	0.0169	0.1713***	0.0168	0.1713***	0.0169
$(Strategy\_Exret)_{t-1}$	0.5707**	0.2417	0.5802**	0.2429	0.5785**	0.2425	0.6001***	0.2437

(Strategy_Fundflow)$_{t-1}$	-0.00557	0.0599	-0.00612	0.0605	-0.00496	0.06	-0.00757	0.0605
Similar_Strategy	1.3668***	0.0314	1.3763***	0.0316	1.3698***	0.0314	1.376***	0.0316
Different_Sub_Strategy	1.3865***	0.0352	1.354***	0.0354	1.3801***	0.0354	1.3554***	0.0355
Leverage_Largest	0.0612**	0.0305	0.0601**	0.0307	0.0594**	0.0306	0.0584*	0.0307
Market_Return	0.3038	0.3684	0.2318	0.371	0.2847	0.3693	0.2413	0.3723
High _Mgmt_Fee	0.1675***	0.0275	0.167***	0.0276	0.1647***	0.0276	0.168***	0.0277
High_Incentive_Fee	0.2545***	0.0307	0.2322***	0.0307	0.2589***	0.0307	0.2331***	0.0308
(Strategy_New_funds)$_{t-1}$	0.00192***	0.000291	0.00193***	0.000293	0.00192***	0.000292	0.0019***	0.000293
(Strategy_No_of_funds)$_{t-1}$	-0.0002***	0.000053	-0.00021***	0.000053	-0.0002***	0.000053	-0.0002***	0.000053
Rsd_Familysize_Avg	0.2019***	0.0131			0.1993***	0.0132		
Rsd_Familysize_Med			0.2377***	0.0128			0.236***	0.0129
Exsize$_{t-1}$	0.0112***	0.000755	0.00898***	0.000929				
EM Exsize$_{t-1}$*					0.00934***	0.00269	0.00831***	0.00329
ED Exsize$_{t-1}$*					0.00719***	0.0026	0.0033	0.00318
GM Exsize$_{t-1}$*					0.0141***	0.00411	0.0149**	0.00618
LO Exsize$_{t-1}$*					0.0247***	0.00752	0.0217**	0.0103
RV Exsize$_{t-1}$*					0.0139***	0.00121	0.011***	0.00147
SF Exsize$_{t-1}$*					0.00746***	0.0029	0.0113***	0.00328
Strategy Dummies	Yes		Yes		Yes		Yes	
Year Dummies	Yes		Yes		Yes		Yes	
Pseudo R-Square	0.4219		0.4252		0.4235		0.4259	

Table 10

Robustness Check B - Propensity of New Fund Opening for Large Fund Family Sub Sample

This table reports estimated coefficients and their standard errors from the Probit regression model described in Equation 4 of Section III. The sample of the study is hedge funds included in Barclay's Global Hedge Fund database, over the sample period of 1990 to 2007. For the models estimated in this table the data of the large fund family sub sample as defined in Section IV.B is used. The dependent variable is a dummy variable which takes the value 1 if fund family opens a new hedge fund in a specific strategy category in a particular year within the sample period, and it takes the value zero (0) otherwise. The independent variables are fund family's previous year's excess return, fund flow and size ($(Family\_Exret)_{t-1}$, $(Family\_fundflow)_{t-1,}$ *Rsd_Familysize_ Avg Rsd_Familysize_Med respectively)*. Other independent variables are, natural logarithm of fund strategy category's previous year's asset under management $Log(Strategy\_AUM)_{t-1}$, previous year's excess return and fund flow to the strategy category ($(Strategy\_Exret)_{t-1,}$ $(Strategy\_Fundflow)_{t-1}$ respectively); dummy variable identifying new funds with strategy similar to the largest fund of the family (*Similar_Strategy)*, dummy variable identifying use of leverage by the largest fund of the family, dummy variables identifying if the largest fund's management fees and incentive fees are above industry median (*High _Mgmt_Fee, High_Incentive_Fee*), number of new funds opened in the previous years in a strategy class ($(Strategy\_New\_funds)_{t-1}$), total number of funds in a strategy class ($(Strategy\_No\_of\_funds)_{t-1}$). The proxy of capacity constraints used in these models are excess fund size variables (*Exsize_Avg*) as defined in Equation 1, we also use excess size measure based on industry median fund sizes (*Exsize_Med*). We also use dummy variables (*Exsize _Avg_Dum , Exsize _Med_Dum*) based on excess size variables to identify fund families' capacity constraints as discussed in Section III. Detail description of all the variables are provided in Table A1 in Appendix 1. This table also provides the pseudo R^2 s of the Probit models estimated. The 1%, 5% and 10% level of statistical significance of the coefficients are indicated using ***, **and * respectively.

	Model 1		Model 2		Model 3		Model 4	
Parameter	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.
Intercept	-5.6727***	0.3534	-5.5199***	0.3514	-5.8197***	0.3602	-5.6625***	0.3574
$(Family\_Exret)_{t-1}$	0.0993	0.0898	0.0766	0.0891	0.0779	0.0896	0.0696	0.0896
$(Family\_fundflow)_{t-1}$	0.00634	0.00531	0.00806	0.00524	0.00741	0.00528	0.00836	0.00524
$Log(Strategy\_AUM)_{t-1}$	0.1248***	0.0151	0.1236***	0.015	0.1293***	0.0153	0.1292***	0.0153
$(Strategy\_Exret)_{t-1}$	0.6616***	0.2235	0.6611***	0.2234	0.6906***	0.2242	0.6882***	0.2249
$(Strategy\_Fundflow)_{t-1}$	-0.0445	0.0589	-0.0473	0.0589	-0.027	0.0572	-0.0295	0.0575
Similar_Strategy	1.2414***	0.0311	1.2362***	0.0311	1.2415***	0.0312	1.2429***	0.0312
Leverage_Largest	0.0589**	0.0312	0.0556*	0.0312	0.0407	0.0314	0.0466	0.0313
Market_Return	0.0733	0.0843	0.0626	0.0844	0.0742	0.0837	0.0782	0.0839
High _Mgmt_Fee	0.0926***	0.0291	0.0991***	0.029	0.1039***	0.0291	0.1056***	0.0291

High_Incentive_Fee	0.2968***	0.031	0.3103***	0.031	0.2897***	0.0313	0.2923***	0.0313
(Strategy_New_funds)$_{t-1}$	0.0025***	0.000241	0.00251***	0.000241	0.00229***	0.000239	0.00235***	0.00024
(Strategy_No_of_funds)$_{t-1}$	-0.000303***	0.000048	-0.000302***	0.000048	-0.000266***	0.000048	-0.000278***	0.000048
Rsd_Familysize_Avg	0.0123***	0.00089	0.0122***	0.000889				
Rsd_Familysize_Med					0.0146***	0.000877	0.0142***	0.000869
Exsize _Avg_Dum	0.2243***	0.0293						
Exsize _Med_Dum					0.1857***	0.047		
Exsize_Avg			0.203***	0.0288				
Exsize_Med							0.17***	0.0286
Strategy Dummy	Yes		Yes		Yes		Yes	
Pseudo Rsq	0.325		0.3235		0.3285		0.3295	

Table 11
Robustness Check B - Propensity of New Fund Opening with Small Fund Family Sub Sample.

This table reports estimated coefficients and their standard errors from the Probit regression model described in Equation 4 of section III. The sample of the study is hedge funds included in Barclay's Global Hedge Fund database, over the sample period of 1990 to 2007. For the models estimated in this table the data of the small fund family sub sample as defined in Section IV.B is used. The dependent variable is a dummy variable which takes the value 1 if fund family opens a new hedge fund in a specific strategy category in a particular year within the sample period, and it takes the value zero (0) otherwise. The independent variables are fund family's previous year's excess return, fund flow and size (*$(Family\_Exret)_{t-1}$* , *$(Family\_fundflow)_{t-1,}$ Rsd_Familysize_ Avg Rsd_Familysize_Med respectively)*. Other independent variables are, natural logarithm of fund strategy category's previous year's asset under management *$Log(Strategy\_AUM)_{t-1}$* , previous year's excess return and fund flow to the strategy category (*$(Strategy\_Exret)_{t-1,}$ $(Strategy\_Fundflow)_{t-1}$* respectively); dummy variable identifying new funds with strategy similar to the largest fund of the family (*Similar_Strategy)*, dummy variable identifying use of leverage by the largest fund of the family, dummy variables identifying if the largest fund's management fees and incentive fees are above industry median (*High _Mgmt_Fee*, *High_Incentive_Fee*), number of new funds opened in the previous years in a strategy class (*$(Strategy\_New\_funds)_{t-1}$*), total number of funds in a strategy class (*$(Strategy\_No\_of\_funds)_{t-1}$*). The proxy of capacity constraints used in these models are excess fund size variables (*Exsize_Avg*) as defined in Equation 1, we also use excess size measure based on industry median fund sizes (*Exsize_Med*). We also use dummy variables (*Exsize _Avg_Dum* , *Exsize _Med_Dum*) based on excess size variables to identify fund families' capacity constraints as discussed in Section III. Detail description of all the variables are provided in Table A1 in Appendix 1. This table also provides the pseudo R^2 s of the Probit models estimated. The 1%, 5% and 10% level of statistical significance of the coefficients are indicated using ***, **and * respectively.

	Model 1		Model 2		Model 3		Model 4	
Parameter	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Intercept	-6.0121***	0.3458	-5.7589***	0.3415	-6.1409***	0.3436	-5.7993***	0.3403
$(Family\_Exret)_{t-1}$	0.106	0.0734	0.0744	0.0702	0.0622	0.0737	0.0847	0.0704
$(Family\_fundflow)_{t-1}$	0.00241	0.00459	0.00477	0.00449	0.00216	0.0045	0.0051	0.00446
$Log(Strategy\_AUM)_{t-1}$	0.1411***	0.0151	0.1375***	0.015	0.1387***	0.015	0.1369***	0.0149
$(Strategy\_Exret)_{t-1}$	0.3087	0.2128	0.338	0.212	0.32	0.213	0.3461*	0.2128
$(Strategy\_Fundflow)_{t-1}$	0.00546	0.0555	-0.000096	0.0555	0.0111	0.0548	0.00496	0.0553
Similar_Strategy	1.2357***	0.0303	1.2153***	0.0298	1.2378***	0.0303	1.2184***	0.0298
Leverage_Largest	0.1163***	0.0302	0.0992***	0.0302	0.1024***	0.0302	0.0983***	0.0302
Market_Return	0.0696	0.0816	0.0704	0.0812	0.0457	0.0811	0.0752	0.0806
High _Mgmt_Fee	0.1751***	0.028	0.1937***	0.0277	0.1892***	0.0279	0.1969***	0.0277
High_Incentive_Fee	0.2102***	0.0302	0.2707***	0.0298	0.2447***	0.0303	0.2698***	0.0298

(Strategy_New_funds)$_{t-1}$	0.00227***	0.00023	0.0023***	0.000229	0.00222***	0.000228	0.00228***	0.000227
(Strategy_No_of_funds)$_{t-1}$	-0.000311***	0.000046	-0.000309***	0.000046	-0.000304***	0.000046	-0.000308***	0.000046
Rsd_Familysize_Avg	0.00647***	0.000859	0.0056***	0.000855				
Rsd_Familysize_Med					0.00962***	0.000846	0.00625***	0.00082
Exsize _Avg_Dum	0.5696***	0.0284						
Exsize _Med_Dum					0.6011***	0.0317		
Exsize_Avg			0.802***	0.0434				
Exsize_Med							0.792***	0.0432
Strategy Dummy	Yes		Yes		Yes		Yes	
Pseudo Rsq	0.3306		0.3209		0.3319		0.3218	

Footnotes:

[1] SAC to Close Its Flagship Fund to New Investors (http://online.wsj.com/article/SB10001424053111903635604576471992592504696.html).

[2]According to a report of Hedge Fund Research, a Chicago based firm, over the last decade hedge funds expanded beyond their traditional investor base among the ultra-rich and raised billions of dollars from pension funds, endowments and foundations. From 1998 to 2008, the number of hedge funds grew from just over 3,000 hedge funds to more than 10,000 and assets within the funds exploded from $374 billion to nearly $2 trillion.

[3] It should be underscored that the issue of capacity constraints associated with hedge funds is a controversial one: It not only questions the future profit potential of the hedge funds but also raises concerns over the influx of less talented fund managers in the industry. For instance, in 2005, a report by Edhec Risk and Asset Management Research Centre provided a comprehensive survey to explore the capacity effect on hedge fund performance. The basic findings of Edhec (2005) are: a) a global increase in fund inflows to hedge funds reduces market inefficiencies. Thus, implementing "niche arbitrage" strategies become less profitable as the fund grows in size; b) over time, the frequency of less talented fund managers entering the industry has increased, attracted by lucrative pay and incentives. Consequently, the average performance of the industry has suffered as the overall size of the industry has grown. In sum, the survey reflects the view that while a majority of hedge fund industry insiders are optimistic about a double digit future growth of the industry, they worry that future arbitrage opportunities will decline due

to capacity constraints. Regarding the existence of a critical size of hedge funds, the respondents were almost equally divided although the overarching belief was that the market's, as well as manager's, capacity are two major threats to hedge fund performance.

[4]SAC to Close Its Flagship Fund to New Investors http://online.wsj.com/article/SB10001424053111903635604576471992592504696.html

[5] Are Hedge Funds Drowning In Flood Of New Money?

http://www.tax-news.com/news/Are_Hedge_Funds_Drowning_In_Flood_Of_New_Money____6319.html

[6] As a robustness check we also use average excess size of the existing funds in the family as an alternative proxy for fund families' capacity constraint.

[7] Existing hedge fund studies such as Aragon (2007), Fung, Hsieh, Naik, and Ramadorai (2008) find that the performance estimates of hedge funds are sensitive to database choices and suggest a combined use of multiple databases. However, given that performance measurement is not the main focus of our study, our choice of the BHFD data base appears appropriate. Without implicating him in any way, we thank Bill Fung for his discussions with the authors on this point.

[8] Only 18 new hedge funds were opened when Short Bias was the strategy of the largest fund in the family.

[9] Including these funds in the sample does not introduce bias our analysis; if anything it makes our job of finding evidence in favor of the stated hypotheses more difficult as those above mentioned strategy classes are less likely to show any evidence of capacity constraints because of the

relative vagueness in strategy classification as mentioned above. For the sake of robustness we also carry out our analyses on a sample that completely excludes funds with those strategy classes. The results are qualitatively similar in both samples.

[10] We do not foresee any problems due to the non-identification of the domicile of this small proportion of funds in our sample. In the robustness section we partition the sample based on the fund domicile of the identifiable funds. The result of this robustness check is qualitatively similar to our original analysis.

[11] If fund managers continuously monitor the capacity of their funds and act proactively open new funds to avoid reaching the critical fund size then excess size variables defined in Eq.(1) and other alternative definitions discussed above should explain the probability of new fund opening decisions; however if fund managers only react to their capacity constraints once the funds cross the critical size and they are left with no excess capacity in that case the discrete dummy variable identifying funds with no excess capacity should explain the probability of new fund opening better.

[12] As a robustness check we include a fund sub-strategy dummy in the Probit models. Specifically, the dummy variable takes the value 1 when fund families open new funds in a sub-strategy different from the fund sub- strategy of the largest fund of the family, and takes the value zero otherwise. Results show that the sub strategy dummy is positively related to the probability of new fund opening at the 1% level of significance.

[13] One may reconcile this week evidence of capacity constraint in this strategy classes by arguing that funds with *Long only* strategy invests in relatively broader market segments therefore has capacity to absorb greater fund flows compared to other strategy classes that searches for alpha in various niche markets .

[14] In Figures 6 and 7 the critical sizes for the *Long Only* strategy is not plotted as there is little evidence of capacity constraints in this strategy, in Model 2 and 4 reported in Table 5, capacity constraint variables for *Long Only* strategy is not significant which may suggest that there is no the critical size for this strategy.

[15] The data on hedge fund risk factors used for estimation of the 7 factor model are collected from the website of David A. Hsieh: http://faculty.fuqua.duke.edu/~dah7/DataLibrary/TF-FAC.xls

[16] The results of this robustness test are qualitatively quite similar to the results of the original analysis. We do not provide the detail results of this robustness test in the paper just to avoid repetitive reporting of similar results. However these results are available upon request.

[14] The results of this robustness test are qualitatively quite similar to the results of the original analysis. We do not provide the detail results of this robustness test in the paper just to avoid repetitive reporting of similar results. However these results are available upon request.