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Hedge Fund Franchises

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Abstract. We investigate the growth strategies of hedge fund firms. We find that firms with successful first funds are able to launch follow-on funds that charge higher performance fees, set more onerous redemption terms, and attract greater inflows. Motivated by the aforementioned spillover effects, first funds outperform follow-on funds, after adjusting for risk. Consistent with the agency view, greater incentive alignment moderates the performance differential between first and follow-on funds. Moreover, multiple-product firms underperform single-product firms but harvest greater fee revenues, thereby hurting investors while benefitting firm partners. Investors respond to this growth strategy by redeeming from first funds of firms with follow-on funds that do poorly. Empirically, the multiple-product firm has become the dominant business model for the hedge fund industry.

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Keywords: hedge funds • spillover • agency problems • first funds • follow-on funds

> The Board's point of view is that at its essence the Man Group's strategy is a growth strategy.... And when we're looking therefore at each aspect of our business, we have to be able to grow it. We have to be able to scale it. —Kevin Hayes, Man Group[1]

1. Introduction

Hedge funds collectively managed close to US$3.15 trillion in assets in the second quarter of 2019.[2] Institutional investors have grown to become the dominant investor clientele in this industry.[3] Concomitantly, increased regulatory and compliance costs, as well as a heightened pressure to lower hedge fund fees, have ratcheted up the critical mass needed for a hedge fund firm to sustain operations with management fee revenues.[4] Therefore, it has become imperative for hedge fund firms to grow in order to attract large institutional investors and to spread the higher fixed costs over a larger asset base. Although recent academic work has emphasized how the incentives of hedge fund managers motivate asset growth (Lim et al. 2016, Yin 2016), the question remains: how do hedge fund firms grow?

Our paper fills this gap by focusing on the behavior of hedge fund firms who have managed to create a track record and who now face a choice of growth strategy. We start with the observation that hedge fund firms often operate multiple funds, and not all funds managed by a hedge fund firm command the same regard from investors. Anecdotal evidence suggests that the reputation of a multiple-fund firm rests heavily on the performance of its first fund.[5] Having started her first fund, in order to grow her business, a hedge fund manager faces two choices. She could (i) simply grow the assets under management (henceforth AUM) of a single commingled fund or product, or (ii) offer multiple funds or products. Which of these two options is the preferred one? Do hedge fund firms leverage off the stellar performance of their first funds to launch additional funds? Do the capital-raising activities of multiple-product firms benefit investors? How do such activities impact the total fee revenue of the hedge fund firm? And how do investors respond to firms that launch multiple products?

Our results are striking. We find that hedge fund firms with successful first funds are more likely to launch multiple follow-on funds. Moreover, the follow-on funds that they launch charge higher performance fees, set more onerous redemption terms, and attract greater inflows. These effects prevail after controlling for the performance of the other follow-on funds conceived by the same firm. Indeed, past first fund performance predicts future flows into follow-on funds over and above the explanatory power of their respective track records. Further, the intrafirm spillover effects from first funds are substantially stronger than those from the other funds launched by hedge fund firms.

In light of the positive spillover effects engendered by first funds, are managers incentivized to deliver better performance with the earlier funds launched by their firms? We find that first funds outperform follow-on funds by 1.88% per annum after adjusting for covariation with the Fung and Hsieh (2004) seven factors and controlling for the other variables that can explain fund performance. The effect is statistically significant at the 1% level. Moreover, the difference between first and follow-on fund performance is even stronger for the follow-on funds that are launched later. The abnormal return spread between the first and the second to fifth funds launched is a statistically reliable but economically modest 1.79%, whereas the analogous spread between the first and the 11th to 20th funds launched is an impressive 3.45% per year. These findings cannot be explained by differences in fund share restrictions and illiquidity (Aragon 2007, Aragon and Strahan 2012), fund fees (Agarwal et al. 2009), age (Aggarwal and Jorion 2010), size (Berk and Green 2004), return smoothing behavior (Getmansky et al. 2004), and backfill and incubation bias (Liang 2000, Bhardwaj et al. 2014).

Hedge fund investors do not benefit from the capital-raising activities of multiple-product firms. Portfolio sorts indicate that multiple-product firms on average underperform single-product firms by a statistically reliable 3.77% per annum after adjusting for risk. Yet, despite underperforming single-product firms, multiple-product firms harvest fee revenues that are on average US$21.68 million per annum higher than those harvested by single-product firms. The larger size of the multiple-product firms explains much of the difference in fee revenue.[6]

Empirical evidence shows that the outperformance of the first fund is driven by strong initial performance, which moderates after the launch of the first follow-on fund. Prior to follow-on fund launches, first funds of multiple-product firms deliver a return of 10.83% per year after adjusting for risk. However, upon the launch of the first follow-on fund, first funds' alpha deteriorates by 5.35% per annum. The reduction in performance is 1.92% greater than that for comparable first funds at other firms and is driven in part by limited attention and the crowding out of investment opportunities. Instead of protecting the first fund's performance by limiting its AUM growth, multiple-product firms typically grow AUM across all products, that is, first as well as follow-on.

Investors' confidence in firms with successful first funds is not completely misplaced. Stellar first fund performance is associated with better subsequent follow-on fund and first fund performance. We find that, on average, a one percentage point increase in the first fund's monthly alpha in the 12-month period prior to the launch of the first follow-on fund precipitates a 13.6 basis point increase in follow-on fund monthly alpha and a 12.6 basis point increase in the first fund monthly alpha in the 12-month postlaunch period. Therefore, it seems that investors who subscribe to a new fund launched by a hedge fund firm with a stellar first fund are responding rationally to the positive outlook that such an event is signaling at the beginning of the firm's capital-raising campaign.

Just as stellar performance of the first fund can help capital raising for the firm, poor performance of follow-on funds can be detrimental to this process. We find evidence of a significant blowback effect from follow-on funds to the first fund. Lower follow-on fund returns over the past one and two years are associated with lower flows into the first fund of the same hedge fund firm after controlling for past first fund returns, flows, and performance volatility. This blowback effect suggests that firms need to balance quantity with quality when embarking on such a growth path.

The endogeneity of firm growth strategy does not explain the underperformance of hedge funds launched later by firms. The multivariate regression methodology that we employ allows us to sidestep concerns that observed differences between funds managed by single- and multiple-product firms explain our results. To cater for unobserved differences between single- and multiple-product firms, we run an instrumental variables analysis with the supply of investment capital at firm founding as the instrument. We find that first funds outperform follow-on funds even more after instrumenting for firm growth strategy. Similarly, the more general result that the later funds launched by firms underperform the earlier funds prevails after instrumenting for firm multiple-product status. Our choice of instrument follows Asker et al. (2015) and is robust to alternative specifications.

The results in this paper resonate with two strands of research on hedge funds. The first strand sheds light on hedge fund alpha and finds that incentivized (Agarwal et al. 2009), geographically proximate (Teo 2009), emerging (Aggarwal and Jorion 2010), and distinctive (Sun et al. 2012) hedge funds deliver higher alpha. We show that hedge funds that are conceived earlier by their firms also outperform.[7]

The second strand examines agency problems and finds that some hedge funds strategically delay reporting poor performance (Aragon and Nanda 2017), inflate their December returns (Agarwal et al. 2011), and take on excessive liquidity risk (Teo 2011).[8] We find that, consistent with the agency view, better incentive alignment via manager coinvestment, greater weight on incentive fees, higher manager total deltas, and elevated flow-performance sensitivity help ameliorate the tendency of hedge fund firms to launch follow-on funds that underperform first funds.

This paper echoes research on the strategic behavior of mutual fund families (Massa 2003, Nanda et al. 2004, Gaspar et al. 2006, Sialm and Tham 2016).

Whereas Massa (2003) investigates the relation between the performance of a mutual fund family in a category and the degree of product differentiation in the category, we study the link between the performance of a hedge fund firm and the degree of fund or strategy proliferation in the firm itself. Unlike Nanda et al. (2004), who document positive spillover effects in the form of greater flows to the other mutual funds of families with stars, we show that, for hedge funds, intrafirm spillover effects extend beyond flows to include fees, redemption terms, and performance.

Our work complements Kolokolova (2011) and Yin (2016). Kolokolova (2011) finds that hedge fund firms with high past returns are more likely to launch new funds and attract inflows. She does not differentiate between first and follow-on funds. We believe that focusing on first funds is critical as stellar first fund performance allows a firm to transition from a single-product to a multiple-product firm. Indeed, we show that the spillover effects are substantially stronger from first funds to follow-on funds than from follow-on funds to the later funds launched by the firm. Further, stellar first fund performance is a reliable harbinger of future fund launches. Therefore, the performance of the first fund is a stronger determinant of hedge fund firm growth than is the performance of the subsequent funds launched by the same firm. Yin (2016) argues that the hedge fund management compensation contract induces individual hedge funds to grow beyond that which is optimal for fund performance. Whereas Yin (2016) focuses on the growth of the individual hedge fund, we focus on the growth of the hedge fund firm.

Relative to Kolokolova (2011) and Yin (2016), we deepen our understanding of firm strategic behavior by (i) documenting intrafirm spillover effects from first funds to follow-on funds and vice versa, that is, the blowback flow effect, (ii) uncovering the relation between fund launch order and performance, (iii) showing that incentive alignment helps ameliorate the tendency of firms to launch follow-on funds that underperform first funds, (iv) exploring intrafirm fund performance persistence, (v) testing the impact of firm strategy diversification on fund performance, and (vi) tracing the deterioration in first fund performance when firms launch follow-on funds to limited attention and the crowding out of investment opportunities. By finding evidence of intrafirm performance persistence, we resolve the conundrum raised by Kolokolova (2011) about the apparent irrationality of fund investors that respond to short-lived firm performance. Our results suggest that stellar first fund performance not only allows first funds to grow capital beyond the optimal point, as in Yin (2016), but also allows their management companies to do likewise via the launch of follow-on funds. Consequently, the indirect incentives facing hedge fund managers, especially those managing first funds, are likely to be even stronger than those suggested by Lim et al. (2016).

This research also relates to recent work by Sun and Teo (2019) on public hedge funds. They find that hedge funds operated by listed firms significantly underperform hedge funds operated by unlisted firms. They trace the underperformance to the weakened alignment between ownership, capital, and control when fund management companies go public, which engenders conflicts of interests. Like Sun and Teo (2019), we analyze agency problems in the hedge fund industry. Unlike Sun and Teo (2019), we study the growth trajectory of hedge fund firms and the performance differential between funds launched at different stages of a firm's growth. Moreover, unlike Sun and Teo (2019) who document how public listings affect the severity of agency problems at hedge fund firms, we explore the implications of agency problems on hedge fund firms' optimal growth strategy.

The remainder of this paper is organized as follows. Section 2 describes the data and methodology. Section 3 reports the results from the empirical analysis, and Section 4 presents a medley of robustness tests. Section 5 concludes.

2. Data and Methodology

We evaluate hedge funds using monthly net returns and AUM data of live and dead hedge funds reported in the Lipper Hedge Fund Database (TASS), Hedge Fund Research (HFR), and BarclayHedge datasets from January 1990 to December 2013.[9] Because TASS, HFR, and BarclayHedge started distributing their data in 1994, the data sets do not contain information on funds that died before December 1993. This gives rise to survivorship bias. We mitigate this bias by focusing on data from January 1994 onward.

In our fund universe, we have a total of 16,828 hedge funds, of which 5,633 are live funds and 11,195 are dead funds. The funds are roughly evenly split between the three databases. Although 1,704 funds appear in all three databases and 3,256 funds appear in two databases, many funds belong to only one database. Specifically, there are 3,729 funds, 3,735 funds, and 4,404 funds peculiar to the TASS, HFR, and BarclayHedge databases, respectively. This highlights the advantage of obtaining data from multiple sources. In our analysis, we focus on the sample of funds without duplicate share classes due to concerns that funds with multiple share classes could cloud the analysis.[10] Removing duplicate share classes from the sample leaves us with a total of 15,607 hedge funds, of which 5,269 are live funds and 10,338 are dead funds.

We define first funds as the first fund launched by each hedge fund firm. Follow-on funds are the other funds launched by hedge fund firms. To determine fund status, we sort our sample of funds based on fund

inception date within the firm. To ensure that there is only one first fund per firm, when more than one fund is launched in the same month by a firm, we merge them to form a composite fund and treat it as that firm's first fund.[11] The fund attributes and monthly returns of the composite fund are simply the average fund attribute and average monthly returns of its component funds, respectively. The monthly AUM of the composite fund is the sum of the monthly AUM of its component funds.

Following Joenväärä et al. (2020), we classify hedge funds into 12 investment styles: commodity trading advisor, emerging markets, event driven, global macro, long only, equity long/short, market neutral, multi-strategy, relative value, sector, short bias, and others. Table 1 breaks down the funds by investment strategy and reports the first and follow-on fund distribution as well as the number of live and dead funds in each strategy. To facilitate comparison with our overall fund sample, the first funds reported in Table 1 include all the component first funds launched by hedge fund firms. So, there are more first funds reported in Table 1 than there are firms. There are 6,882 firms in our sample. When the component funds are grouped together to form composite funds so that each firm is linked to only one first fund, there are 4,618 firms with only one fund, 1,921 firms with two to five funds, 232 firms with six to 10 funds, 85 firms with 11 to 20 funds, and 26 firms with more than 20 funds. The time between successive fund launches is a decreasing function of the number of funds already launched by the firm. After conceiving its first fund, a firm takes about 38 months on average to launch the second fund, another 28 months to launch the third fund, and another 22 months to launch the fourth fund.

Hedge fund data are susceptible to many biases (Liang 2000, Fung and Hsieh 2009). These biases stem from the fact that inclusion in hedge fund databases is voluntary. As a result, there is a self-selection bias. For instance, funds often undergo an incubation period in which they rely on internal funding before seeking capital from outside investors. Incubated funds with

Table 1. Summary Statistics

				Follow-on funds			
	Total funds	Dead funds	1st funds	2nd–5th funds	6th–10th funds	11th–20th funds	Return months
Investment strategy	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Full sample							
Commodity trading advisors	1,507	330	813	537	95	44	89,017
Emerging markets	833	371	320	306	85	46	57,777
Event driven	1,162	329	523	412	125	68	87,973
Global macro	1,949	657	857	727	151	84	117,580
Long only	222	149	62	72	20	18	17,510
Equity long/short	5,341	1,578	2,657	1,772	478	250	377,870
Market neutral	440	96	184	160	46	35	27,780
Multi-strategy	2,222	1,100	839	602	191	184	141,800
Relative value	2,459	815	1,069	880	265	116	152,050
Sector	309	127	132	102	24	25	22,034
Short bias	34	5	19	13	2	0	2,868
Others	350	76	191	124	27	8	18,277
Total	16,828	5,633	7,666	5,707	1,509	878	1,112,500
Panel B: Without duplicate share classes							
Commodity trading advisors	1,455	315	804	516	89	32	85,971
Emerging markets	717	306	311	272	63	37	52,458
Event driven	1,053	301	497	364	105	54	80,807
Global macro	1,850	638	841	663	146	74	112,830
Long only	193	130	63	65	20	15	16,065
Equity long/short	4,922	1,498	2,576	1,555	423	208	357,240
Market neutral	389	86	177	141	37	21	24,939
Multi-strategy	2,139	1,077	833	554	174	178	137,370
Relative value	2,268	744	1,043	799	221	98	142,980
Sector	276	107	128	89	23	22	19,967
Short bias	31	4	18	12	1	0	2,626
Others	314	63	188	102	21	3	16,780
Total	15,607	5,269	7,479	5,132	1,323	742	1,050,000

Notes. The sample period is from January 1994 to December 2013. Funds are grouped according to their primary investment strategy. The list of strategies follows Joenväärä et al. (2020) and includes commodity trading advisors, emerging markets, event driven, global macro, long only, equity long/short, market neutral, multi-strategy, relative value, sector, short bias, and others.

successful track records then go on to list in various hedge fund databases, while the unsuccessful funds do not, resulting in an incubation bias. Related to this, when a fund is listed on a database, it often includes data prior to the listing date. Again, because successful funds have a strong incentive to list and attract capital inflows, these backfilled returns tend to be higher than the nonbackfilled returns. In the analysis that follows, we will repeat the tests after dropping the first 24 months of return data from each fund to ensure that the results are robust to backfill and incubation bias. To fully address concerns about backfill bias raised by Bhardwaj et al. (2014) and others, we also redo the tests after removing all return observations that have been backfilled prior to the fund listing date.

Throughout this paper, we model the risks of hedge funds using the Fung and Hsieh (2004) seven-factor model. The Fung and Hsieh factors are the excess return on the Standard and Poor's (S&P) 500 index (SNPMRF); a small minus big factor (SCMLC) constructed as the difference between the Wilshire small and large capitalization stock indices; the yield spread of the US 10-year Treasury bond over the three-month Treasury bill, adjusted for duration of the 10-year bond (BD10RET); the change in the credit spread of Moody's BAA bond over the 10-year Treasury bond, also appropriately adjusted for duration (BAAMTSY); and the excess returns on portfolios of lookback straddle options on currencies (PTFSFX), commodities (PTFSCOM), and bonds (PTFSBD), which are constructed to replicate the maximum possible return from trend following strategies (see Fung and Hsieh 2001) on their respective underlying assets.[12] These seven factors have been shown by Fung and Hsieh (2004) to have considerable explanatory power on hedge fund returns.

3. Empirical Results

3.1. Spillover Effects Within Hedge Fund Firms

Our first set of tests focuses on spillover effects within hedge fund firms. We ask, do hedge fund firms take advantage of the stellar performance of their first funds to launch additional funds? If so, how does superior first fund performance benefit the follow-on funds managed by the same firm?

To test the relation between first fund performance and the probability of follow-on fund launches, we estimate logit regressions on *LAUNCH*, an indicator variable that takes a value of one if a firm launches at least one fund in that year. We include as an independent variable *FIRSTALPHA* or first fund alpha averaged over the last 12, 24, and 36 months. Fund alpha is fund monthly abnormal return after stripping away covariation with the Fung and Hsieh (2004) seven factors and is estimated for all funds with at least 24 months of return information.[13] We control for calendar year fixed effects and base statistical inferences on White (1980) heteroskedasticity-consistent standard errors clustered at the firm level. The results reported in the leftmost column of Table 2 indicate that past stellar first fund performance is a reliable harbinger of future fund launches. The coefficient estimates on *FIRSTALPHA* are statistically significant at the 1% level for all lookback horizons. The marginal effects indicate that a one standard deviation (or 0.92 percentage point) increase in past 36-month alpha is associated with a 0.83 percentage point increase in the probability of a fund launch the next year. This is economically significant given that the unconditional probability of launching at least one fund in any year is 7.53 percentage points.

Unsurprisingly, the association between first fund performance and future fund launches is stronger for the earlier follow-on funds launched by a firm. We define *SECONDALPHA* and *THIRDALPHA* as the alphas of the second and third funds launched by the firm, respectively. When we include as an additional independent variable *SECONDALPHA* in the regressions, we find that the coefficient estimates on *FIRSTALPHA* are still statistically significant at the 1% or 5% level, whereas those on *SECONDALPHA* are not. However, when we also include as an additional independent variable *THIRDALPHA* in the regressions, we find that the coefficient estimate on *FIRSTALPHA* is statistically significant at the 5% level only for monthly alpha averaged over the last 36 months. This suggests that first fund performance is a more reliable predictor of the second and third fund launches than of the later fund launches by the same firm.

Since, hedge fund investors may not chase complex risk-adjusted measures such as the Fung and Hsieh (2004) alpha, we re-estimate the logit regressions with fund returns in place of fund alphas. It is comforting to note that the results are even stronger when we analyze fund returns. As shown in columns (4)–(6) of Table 2, the coefficient estimates on *FIRSTRET* are significant at the 1% level in the univariate regressions and in the regressions that control for *SECONDRET* over all performance horizons. They are also significant at the 5% level when we include *THIRDRET* as an additional independent variable for monthly returns averaged over the last 12 or 36 months. Simply put, *FIRSTRET*, *SECONDRET*, and *THIRDRET* are the fund return equivalents of *FIRSTALPHA*, *SECONDALPHA*, and *THIRDALPHA*, respectively.[14] Collectively, these results suggest that the performance of the first fund is a stronger determinant of firm growth than is the performance of the subsequent funds launched by the same firm.

Table 2. Logit Regressions on Probability of Hedge Fund Launch

	Dependent variable: *LAUNCH*					
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Regressions with monthly alphas or returns averaged over the last 12 months						
FIRSTALPHA	0.056**	0.055*	0.024			
	(4.73)	(2.17)	(0.59)			
	[0.005]	[0.008]	[0.005]			
SECONDALPHA		0.028	0.003			
		(1.16)	(0.09)			
		[0.004]	[0.001]			
THIRDALPHA			0.087**			
			(2.60)			
			[0.017]			
FIRSTRET				0.057**	0.062**	0.063*
				(5.91)	(2.99)	(1.98)
				[0.005]	[0.009]	[0.012]
SECONDRET					0.021	–0.003
					(1.05)	(–0.11)
					[0.003]	[–0.001]
THIRDRET						0.067*
						(2.53)
						[0.013]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.019	0.025	0.040	0.019	0.026	0.041
Number of observations	38,455	9,285	3,504	39,744	9,741	3,693
Panel B: Regressions with monthly alphas or returns averaged over the last 24 months						
FIRSTALPHA	0.091**	0.080*	0.021			
	(5.60)	(2.14)	(0.32)			
	[0.007]	[0.013]	[0.004]			
SECONDALPHA		0.057	0.054			
		(1.75)	(0.95)			
		[0.005]	[0.010]			
THIRDALPHA			0.117*			
			(2.47)			
			[0.023]			
FIRSTRET				0.098**	0.101*	0.066
				(7.15)	(3.14)	(1.22)
				[0.008]	[0.014]	[0.012]
SECONDRET					0.062*	0.037
					(2.22)	(0.79)
					[0.009]	[0.007]
THIRDRET						0.100**
						(2.57)
						[0.019]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.021	0.028	0.040	0.021	0.029	0.041
Number of observations	37,220	9,056	3,406	38,362	9,490	3,591
Panel C: Regressions with monthly alphas or returns averaged over the last 36 months						
FIRSTALPHA	0.124**	0.121**	0.165*			
	(6.25)	(2.72)	(2.04)			
	[0.009]	[0.017]	[0.031]			
SECONDALPHA		0.057	0.020			
		(1.46)	(0.28)			
		[0.007]	[0.004]			
THIRDALPHA			0.101			
			(1.82)			
			[0.019]			

Table 2. (Continued)

	Dependent variable: *LAUNCH*					
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)
FIRSTRET				0.131**	0.141**	0.169*
				(7.35)	(3.43)	(2.44)
				[0.010]	[0.019]	[0.031]
SECONDRET					0.067	0.018
					(1.80)	(0.30)
					[0.009]	[0.003]
THIRDRET						0.085
						(1.78)
						[0.016]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2	0.024	0.031	0.045	0.024	0.033	0.046
Number of observations	35,370	8,579	3,231	36,002	8,794	3,321

Notes. Logit regressions are estimated on the probability each year of launching a fund by each hedge fund firm. The dependent variable is *LAUNCH* which takes a value of one if a firm launches at least one fund in a specific year and a value of zero otherwise. The independent variables include *FIRSTALPHA*, *SECONDALPHA*, *THIRDALPHA*, *FIRSTRET*, *SECONDRET*, and *THIRDRET*, where *FIRSTALPHA* is the alpha of the first fund conceived by the firm averaged over the last x months prior to that year, *SECONDALPHA* is the alpha of the second (or first follow-on) fund conceived by the firm averaged over the same period, *THIRDALPHA* is the alpha of the third (or second follow-on) fund conceived by the firm averaged over the same period, and *FIRSTRET*, *SECONDRET*, and *THIRDRET* are the fund return equivalents of *FIRSTALPHA*, *SECONDALPHA*, and *THIRDALPHA*, respectively. The regressions include controls for calendar year fixed effects. The z-statistics, derived from robust standard errors clustered by firm, are in parentheses. Marginal effects are in brackets. In panels A, B, and C, the lookback period x equals 12, 24, and 36 months, respectively. The sample period is from January 1994 to December 2013.
*Significant at the 5% level; **significant at the 1% level.

Next, we test the relation between the past performance of the first fund and the fund attributes of as well as flows into follow-on funds. Specifically, we estimate the following Ordinary Least Squares (OLS) regressions:

$$\begin{aligned} FUNDATTRIBUTE_i = {} & a + bFIRSTALPHA_{im-12,m-1} \\ & + cNFIRSTALPHA_{im-12,m-1} \\ & + \sum_k d^k STYLEDUM_i^k \\ & + \sum_y e^y YEARDUM_i^y + \epsilon_i, \end{aligned} \quad (1)$$

$$\begin{aligned} FUNDFLOW_{im} = {} & a + bFIRSTALPHA_{im-12,m-1} \\ & + cNFIRSTALPHA_{im-12,m-1} \\ & + dFUNDALPHA_{im-12,m-1} \\ & + eFUNDFLOW_{im-12,m-1} \\ & + fFUNDVOL_{im-12,m-1} \\ & + gFUNDHWM_i \\ & + \sum_k h^k STYLEDUM_i^k \\ & + \sum_y o^y YEARDUM_m^y + \epsilon_{im}, \end{aligned} \quad (2)$$

where, in Equation (1), $FIRSTALPHA_{im-12,m-1}$ and $NFIRSTALPHA_{im-12,m-1}$ are the first and other follow-on fund monthly alpha averaged over the last 12 months prior to the launch of fund i in month m, respectively, $FUNDATTRIBUTE_i$ is either follow-on fund management fee, performance fee, redemption period, or notice period, $STYLEDUM_i^k$ is follow-on fund style dummy for style k, and $YEARDUM_i^y$ is follow-on fund inception year dummy for year y. We assume that the fund attributes reported in the commercial databases are determined at fund launch. In Equation (2), $FUNDFLOW_{im}$ is own fund monthly net inflow, $FUNDALPHA_{im-12,m-1}$ is own fund monthly alpha averaged over the last 12 months, $FUNDVOL_{im-12,m-1}$ is standard deviation of own fund monthly alpha estimated over the last 12 months, and $FUNDHWM_i$ is own fund high-water mark indicator. We also estimate variants of the Equation (1) and (2) regressions where the monthly alphas are averaged over the last 24 or 36 months.[15] Statistical inferences are based on White (1980) heteroskedasticity-consistent standard errors clustered at the fund level.

The results reported in panels A–C of Table 3 indicate that stellar first fund performance confers a variety of benefits to the follow-on funds managed by the same firm. The coefficient estimates on *FIRSTALPHA* in the fund attribute regressions suggest that, after controlling for the performance of the other funds within the same firm, firms with stellar first funds are able to raise follow-on funds that charge higher performance fees as well as set longer redemption and notification periods.[16] The impact of past first fund performance

Table 3. Regressions on Follow-on Fund Attributes and Flow

	Dependent variables				
Independent variable	Follow-on fund management fee	Follow-on fund performance fee	Follow-on fund redemption period	Follow-on fund notice period	Follow-on fund monthly flow
	(1)	(2)	(3)	(4)	(5)
Panel A: Regressions with monthly alphas averaged over the last 12 months					
FIRSTALPHA	0.007	0.257**	0.618	1.121**	0.125*
	(0.72)	(2.84)	(1.65)	(2.92)	(2.39)
NFIRSTALPHA	0.021*	0.342**	0.722	0.987	0.151
	(2.10)	(3.27)	(1.18)	(1.86)	(1.76)
FUNDALPHA					0.860**
					(10.46)
FUNDFLOW					0.268**
					(41.97)
FUNDVOL					–0.308**
					(–14.53)
FUNDHWM					0.227*
					(2.19)
Strategy fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Adj R^2	0.050	0.136	0.099	0.113	0.043
Number of observations	4,757	4,757	4,757	4,757	290,184
Panel B: Regressions with monthly alphas averaged over the last 24 months					
FIRSTALPHA	0.01	0.323**	1.276**	1.776**	0.277**
	(0.91)	(3.46)	(2.60)	(3.54)	(3.75)
NFIRSTALPHA	0.019	0.341**	1.012	1.166	0.168
	(1.84)	(2.84)	(1.58)	(1.88)	(1.38)
FUNDALPHA					0.877**
					(8.62)
FUNDFLOW					0.249**
					(38.29)
FUNDVOL					–0.358**
					(–14.60)
FUNDHWM					0.221*
					(2.09)
Strategy fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Adj R^2	0.047	0.139	0.101	0.114	0.037
Number of observations	4,605	4,605	4,605	4,605	284,420
Panel C: Regressions with monthly alphas averaged over the last 36 months					
FIRSTALPHA	0.015	0.415**	1.447*	1.890**	0.397**
	(1.21)	(4.06)	(2.58)	(3.29)	(4.31)
NFIRSTALPHA	0.024*	0.278*	1.195	1.097	0.174
	(2.17)	(2.19)	(1.77)	(1.66)	(1.36)
FUNDALPHA					0.838**
					(7.88)
FUNDFLOW					0.240**
					(36.32)
FUNDVOL					–0.406**
					(–15.48)
FUNDHWM					0.229*
					(2.13)

Table 3. (Continued)

Independent variable	Dependent variables				
	Follow-on fund management fee	Follow-on fund performance fee	Follow-on fund redemption period	Follow-on fund notice period	Follow-on fund monthly flow
	(1)	(2)	(3)	(4)	(5)
Strategy fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Adj R^2	0.046	0.139	0.102	0.111	0.035
Number of observations	4,455	4,455	4,455	4,455	276,876

Notes. Regressions are estimated on the fees, redemption terms, and flows for follow-on funds managed by each hedge fund firm. For each firm, we distinguish between the first fund launched and other follow-on funds. In the fund attribute regressions, the independent variables include *FIRSTALPHA* and *NFIRSTALPHA*, where *FIRSTALPHA* is the alpha of the first fund within the same firm averaged over the last x months prior to the launch of the follow-on fund and *NFIRSTALPHA* is the alpha of the other follow-on funds within the same firm averaged over the last x months prior to the launch of the follow-on fund. In the fund flow regressions, the independent variables include *FIRSTALPHA*, *NFIRSTALPHA*, *FUNDALPHA*, *FUNDFLOW*, *FUNDVOL*, and *FUNDHWM*, where *FUNDALPHA* is own fund alpha averaged over the last x months, *FUNDFLOW* is own fund flow averaged over the last x months, *FUNDVOL* is standard deviation of own fund abnormal returns estimated over the last x months, and *FUNDHWM* is own fund high-water mark indicator. Fund management fee and performance fee are in percentage, whereas fund redemption period and notice period are in business days. The regressions include controls for follow-on fund investment style and year fixed effects. Inception year fixed effects are used for the regressions on follow-on fund characteristics while calendar year fixed effects are used in the regressions on follow-on fund flow. The t-statistics, derived from robust standard errors that are clustered at the fund level, are in parentheses. In panels A, B, and C, the lookback period x equals 12, 24, and 36 months, respectively. The sample period is from January 1994 to December 2013.

*Significant at the 5% level; **significant at the 1% level.

on follow-on fund performance fee and on notice period is statistically significant at the 1% or 5% level regardless of whether we average first fund alpha over the 12-, 24-, or 36-month period prior to the follow-on fund launch. That on follow-on fund redemption period is statistically significant at the 1% or 5% level when we average first fund alpha over the 24- or 36-month period prior to follow-on fund launch. The results are economically meaningful. For example, a one standard deviation (or 1.44 percentage point) improvement in past 24-month alpha increases the notice period by 2.56 business days. This represents a 12.80% increase relative to a baseline notice period of a month, that is, 20 business days.

Excellent first fund performance also allows hedge fund firms to raise more capital for their follow-on funds. The coefficient estimates on *FIRSTALPHA* in the fund flow regressions indicate that, after controlling for other factors, the impact of first fund performance on follow-on fund flow is positive and statistically significant at the 1% or 5% level for alpha averaged over the past 12, 24, and 36 months. Specifically, a one standard deviation (or 1.44 percentage point) improvement in monthly alpha over the past 24 months is associated with a 0.40% increase in inflows into follow-on funds the next month. We note that the impact of first fund performance on follow-on fund flow is about 31.58% as large as that of own follow-on fund performance, at least based on performance averaged over the past 24 months. Collectively, these results indicate that hedge fund firms are incentivized to deliver stellar performance with their first funds so as to raise follow-on funds on favorable terms. We note that superior follow-on fund performance is associated with higher performance fees for the later follow-on funds launched, although the spillover effects from follow-on funds in general appear to be weaker than those from first funds.

Do these spillover results apply uniquely to first funds as opposed to the second and other follow-on funds launched by hedge fund firms? To test, we re-estimate the Equation (1) and (2) regressions on the fund attributes of and flows into the third and later funds launched by hedge fund firms. We include *SECONDALPHA* and *NSECONDALPHA* as independent variables in place of *FIRSTALPHA* and *NFIRSTALPHA*, respectively, where *SECONDALPHA* is first follow-on fund monthly alpha and *NSECONDALPHA* is fund monthly alpha averaged over all other funds in the firm. The results, reported in Table A.1 of the online appendix, indicate that the spillover effects from first follow-on funds are substantially weaker than those from first funds. Although stellar first follow-on fund performance is associated with longer redemption and notice periods for the subsequent follow-on funds launched by the same firm, it is not associated reliably with higher performance fees or, more importantly, higher flows into those funds.[17]

3.2. Tests of Hedge Fund Performance

To test whether the stronger incentives that first funds face translate to superior performance, we evaluate the performance of first funds relative to that of follow-on funds. Every month, we sort funds within

each hedge fund firm into 20 portfolios based on fund inception date. The nth portfolio corresponds to the nth fund launched by the firm. The first portfolio is simply the first fund portfolio. The other portfolios are the follow-on fund portfolios sorted by launch date within the firm. Next, we average the returns of each fund inception portfolio across hedge fund firms and evaluate the performance of the first fund (portfolio A), the second to fifth funds launched (portfolio B), the sixth to 10th funds launched (portfolio C), and the 11th to 20th funds launched (portfolio D) relative to the Fung and Hsieh (2004) seven-factor model. Portfolio B is simply the average of the second to fifth fund inception portfolios. The other follow-on fund portfolios are defined analogously. Since there are relatively few firms that launch 10 or more funds, the average number of funds in these portfolios decreases as we go from portfolio A to portfolio D. On average, portfolio A comprises 2,238 funds, portfolio B covers 348 funds, portfolio C encompasses 67 funds, and portfolio D contains 18 funds. Statistical inferences are based on White (1980) heteroskedasticity-consistent standard errors.

The results from the fund inception date sort, reported in panel A of Table 4, indicate that first funds outperform follow-on funds. Portfolio A delivers an average return of 5.28% per annum after adjusting for covariation with the Fung and Hsieh (2004) factors, whereas portfolio B delivers an average risk-adjusted return of 3.49%. The risk-adjusted spread between these two portfolios is statistically significant at the 1% level (t-statistic = 5.68) but economically modest at 1.79% per annum after adjusting for risk. The abnormal spread rises to a more impressive 3.45% per annum when we move from portfolio B to portfolio D. These results suggest that the later funds launched by a hedge fund firm tend to underperform the earlier funds launched by the same firm. Since small hedge funds may not be relevant to large institutional investors, we also conduct the portfolio sort on the sample of hedge funds with at least US$20 million of AUM. The results reported in panel B of Table 4 indicate that our findings are not driven by the smallest funds in the sample.

Figure 1 complements the results from panel A of Table 4. It illustrates the monthly cumulative abnormal returns (henceforth CARs) from the portfolio of first funds (portfolio A) and the portfolios of follow-on funds (portfolios B, C, and D). CAR is the cumulative difference between a portfolio's excess return and its factor loadings (estimated over the entire sample period) multiplied by the Fung and Hsieh (2004) risk factors. The CARs in Figure 1 indicate that portfolio A consistently outperforms portfolios B, C, and D over the entire sample period.

There are concerns that first funds may outperform follow-on funds because the former funds manage fewer assets and therefore are less affected by capacity constraints (Berk and Green 2004). To allay such concerns, we estimate the following pooled OLS regression:

$$\begin{aligned} ALPHA_{im} = {} & a + bFIRST_i + c\log(SIZE_{im-1}) \\ & + dMGTFEE_i + ePERFFEE_i \\ & + fNOTICE_i + gAGE_{im} \\ & + \sum_k h^k STYLEDUM_i^k \\ & + \sum_y l^y YEARDUM_m^y + \epsilon_{im}, \end{aligned} \tag{3}$$

where $ALPHA$ is fund monthly abnormal return after stripping away covariation with the Fung and Hsieh (2004) seven factors, $FIRST$ is an indicator variable that takes a value of one when a fund is a first fund and a value of zero otherwise, $SIZE$ is fund monthly AUM in millions of US$, $MGTFEE$ is fund management fee in percentage, $PERFFEE$ is fund performance fee in percentage, $NOTICE$ is fund redemption notification period in months, AGE is fund age in decades, $STYLEDUM$ is fund style dummy, and $YEARDUM$ is year dummy. The coefficient estimate on $FIRST$ provides an indication of the spread in risk-adjusted performance between first and follow-on funds. To facilitate the estimation of fund alpha, we only include results for funds with at least 24 months of return data. We also estimate the analogous regression on raw monthly fund returns to ensure that our findings are not artifacts of the risk adjustment methodology. Statistical inferences are based on White (1980) heteroskedasticity-consistent standard errors clustered at the fund level.

The results from the cross-sectional regression analysis are reported in columns (1) and (2) of Table 5. They corroborate the findings of the portfolio sorts and indicate that first funds outperform follow-on funds. Specifically, the coefficient estimate on $FIRST$ in the alpha regression reported in column (2) of Table 5 reveals that, after controlling for other factors that could explain fund performance, first funds outperform follow-on funds by 1.88% per annum after adjusting for risk. The coefficient estimates on the other control variables accord with the extant literature. High-powered incentives or fees (Agarwal et al. 2009) and longer redemption notice periods (Aragon 2007) are associated with superior performance, whereas fund age is linked to poorer performance (Aggarwal and Jorion 2010). Inferences do not change when we estimate the regression on raw returns suggesting that our findings are not driven by our risk adjustment technology.

To check for robustness, we estimate Fama and MacBeth (1973) regressions in place of the OLS regressions. We compute the standard errors using the

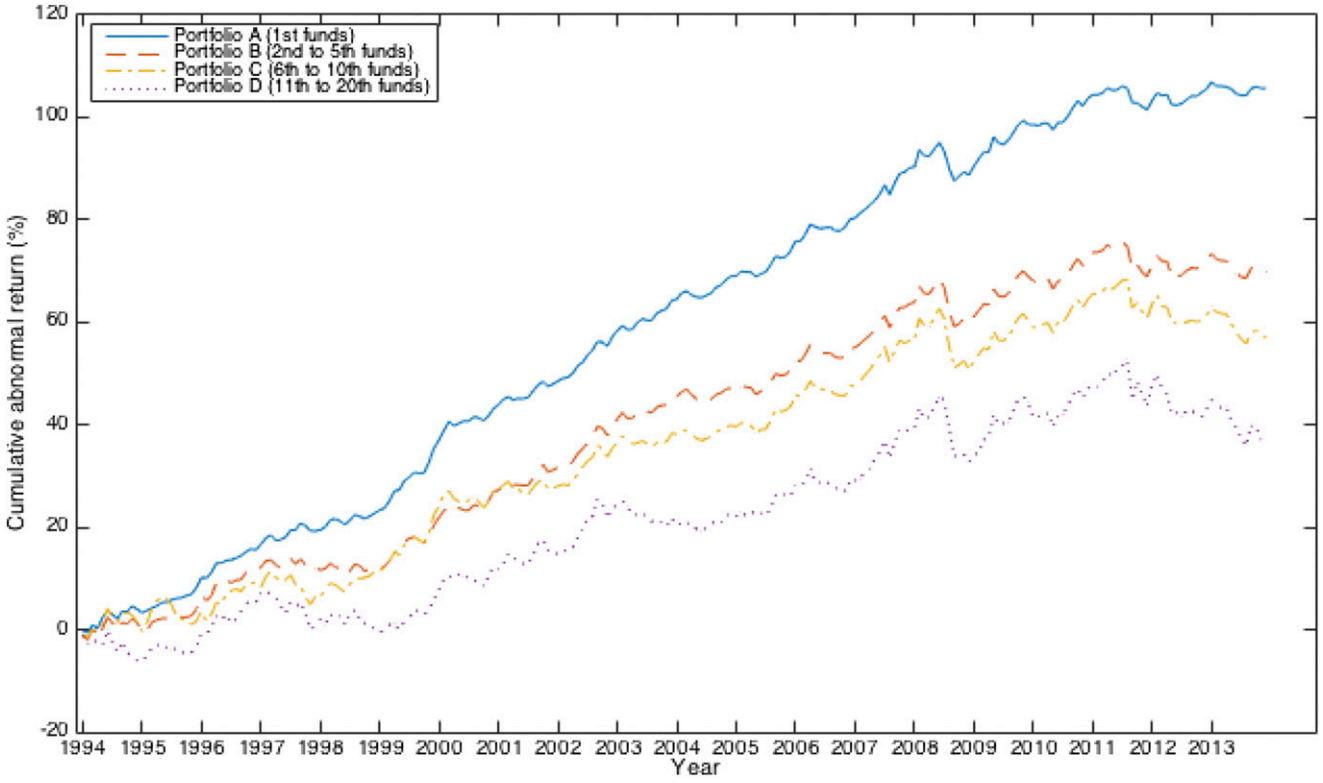
Table 4. Sorts on Hedge Fund Inception Date

Fund portfolio	Excess return (percent/ year) (1)	*t*-statistic of excess return (2)	Alpha (percent/ year) (3)	*t*-statistic of alpha (4)	*SNPMRF* (5)	*SCMLC* (6)	*BD10RET* (7)	*BAAMTSY* (8)	*PTFSBD* (9)	*PTFSFX* (10)	*PTFSCOM* (11)	Adj. R^2 (12)
Panel A: Full fund sample												
Portfolio A (1st funds)	7.99**	5.75	5.28**	6.67	0.27**	0.15**	0.03	0.20**	−0.01	0.01**	0.00	0.70
Portfolio B (2nd to 5th funds launched)	6.35**	4.31	3.49**	3.56	0.26**	0.14**	0.08*	0.25**	−0.01	0.01**	0.00	0.61
Portfolio C (6th to 10th funds launched)	5.94**	3.61	2.84*	2.44	0.28**	0.13**	0.09*	0.28**	−0.01	0.01*	0.00	0.55
Portfolio D (11th to 20th funds launched)	5.20**	2.91	1.82	1.36	0.25**	0.14**	0.11*	0.34**	−0.02	0.01**	0.00	0.48
Spread (A − B)	1.63**	5.01	1.79**	5.68	0.01	0.01	−0.05**	−0.06**	0.00	−0.01**	−0.01	0.14
Spread (A − C)	2.04**	3.62	2.43**	4.39	−0.01	0.02	−0.06**	−0.09**	0.00	−0.01	−0.01	0.07
Spread (A − D)	2.79**	3.41	3.45**	4.29	0.02	0.01	−0.08*	−0.15**	0.01**	−0.01	0.00	0.07
Panel B: Funds with AUM ≥ US$20m												
Portfolio A (1st funds)	6.27**	4.37	3.44**	4.12	0.27**	0.17**	0.04	0.21**	−0.01	0.01*	0.00	0.69
Portfolio B (2nd to 5th funds launched)	5.02**	3.39	2.13*	2.14	0.24	0.14**	0.08*	0.28**	−0.01	0.01**	0.01	0.59
Portfolio C (6th to 10th funds launched)	4.31*	2.28	1.17	0.83	0.28	0.15**	0.09	0.30**	−0.01	0.02*	0.01	0.45
Portfolio D (11th to 20th funds launched)	2.61	1.48	−0.63	−0.47	0.23	0.15**	0.15**	0.32**	−0.02	0.02**	0.00	0.43
Spread (A − B)	1.24**	2.90	1.31**	3.23	0.02	0.03*	−0.04*	−0.08**	0.00	−0.01**	−0.01	0.16
Spread (A − C)	1.96*	1.96	2.27*	2.40	−0.02	0.02	−0.05	−0.09*	0.00	−0.02	−0.01	0.05
Spread (A − D)	3.66**	3.82	4.07**	4.46	0.03	0.02	−0.11**	−0.11**	0.00	−0.02**	0.00	0.06

Notes. Every month, hedge funds are sorted based on their launch date within each hedge fund firm. Alpha is estimated relative to the Fung and Hsieh (2004) seven-factor model. The Fung and Hsieh (2004) factors are the Standard & Poor's (S&P) 500 return minus risk free rate (*SNPMRF*), Wilshire small cap minus large cap return (*SCMLC*), change in the constant maturity yield of the U.S. 10-year Treasury bond adjusted for the duration of the 10-year bond (*BD10RET*), change in the spread of Moody's BAA bond over 10-year Treasury bond appropriately adjusted for duration (*BAAMTSY*), bond PTFS (*PTFSBD*), currency PTFS (*PTFSFX*), and commodities PTFS (*PTFSCOM*), where PTFS is primitive trend following strategy. The *t*-statistics are derived from White (1980) standard errors. The sample period is from January 1994 to December 2013. Panel A reports results for the full sample of hedge funds, whereas panel B reports results for funds with AUM ≥ US$20m.

*Significant at the 5% level; **significant at the 1% level.

Figure 1. (Color online) Cumulative Abnormal Return of Funds Sorted on Fund Inception Date



Notes. Portfolios of hedge funds are constructed by sorting funds based on fund inception date. For each hedge fund firm, the first fund is the first fund launched by the firm. The first fund portfolio is the equal-weighted return of the first funds across firms. The other portfolios are defined analogously. Cumulative abnormal return is the cumulative difference between a portfolio's excess return and its factor loadings multiplied by risk factors from the Fung and Hsieh (2004) seven-factor model. Factor loadings are estimated over the entire sample period. The sample period is from January 1994 to December 2013.

method of Newey and West (1987) with a three-month lag to adjust for dependence across time. The Fama and MacBeth (1973) results reported in columns (3) and (4) of Table 5 echo our previous findings and indicate that they are robust to alternative model specifications.

The portfolio sorts in Table 4 not only suggest that first funds outperform follow-on funds but also allude to the more general finding that the earlier funds launched tend to outperform the later funds launched by the same firm. To test the impact of fund chronology in a regression setting, we re-estimate the Equation (3) regressions with *CHRONO* in place of *FIRST*, where *CHRONO* is fund launch order within the firm. The results reported in columns (5)–(8) of Table 5 indicate that, after controlling for the other factors that influence fund performance, funds that are launched earlier outperform funds that are launched later within each firm. The results are economically and statistically significant. The OLS coefficient estimate on *CHRONO* in column (6) of Table 5 reveals that a one standard deviation or 6.90 fund increase in fund launch order is associated with a 1.16% per annum reduction in fund alpha.[18]

To test whether the underperformance of follow-on funds is driven by agency problems at hedge funds, we compare the performance differential between first and follow-on funds for hedge funds sorted by incentive alignment. One way to align incentives is for the manager to coinvest personal capital alongside her limited partners. Hence, we sort funds into those with and without personal capital and re-estimate the Equation (3) regressions. This is only possible for TASS funds since only TASS provides information on personal capital. The results reported in panel A of Table 6 indicate that, consistent with the agency view, the outperformance of first funds is largely driven by funds with poor incentive alignment, that is, those with no personal capital.[19]

To further investigate the agency view, each year, we sort hedge funds into equal groups based on three additional proxies for incentive alignment: (i) the weight on fund incentive fee, that is, the ratio of fund performance fee to management fee, (ii) fund manager total delta, and (iii) fund flow-performance sensitivity, and re-estimate the Equation (3) regressions. Total delta is computed at the end of the prior year and per appendix A of Agarwal et al. (2009). Fund flow-performance

Table 5. Regressions on Hedge Fund Performance

	Dependent variable							
	OLS		Fama-MacBeth		OLS		Fama-MacBeth	
	RETURN	*ALPHA*	*RETURN*	*ALPHA*	*RETURN*	*ALPHA*	*RETURN*	*ALPHA*
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FIRST	0.146**	0.157**	0.131**	0.140**				
	(10.22)	(10.97)	(7.33)	(8.14)				
CHRONO					−0.011**	−0.014**	−0.021**	−0.022**
					(−13.98)	(−16.51)	(−3.49)	(−4.90)
log(*SIZE*)	−0.037**	−0.018**	−0.043**	−0.022**	−0.039**	−0.020**	−0.043**	−0.022**
	(−8.78)	(−4.25)	(−3.94)	(−2.65)	(−9.20)	(−4.62)	(−3.97)	(−2.69)
MGTFEE	0.033**	0.051**	0.037	0.054*	0.036**	0.057**	0.041	0.060**
	(2.81)	(4.16)	(1.68)	(2.51)	(3.11)	(4.66)	(1.84)	(2.77)
PERFFEE	0.009**	0.019**	0.008*	0.014**	0.008**	0.018**	0.007**	0.014**
	(7.56)	(14.53)	(2.30)	(5.99)	(6.91)	(13.81)	(2.25)	(5.97)
NOTICE	0.001**	0.001**	0.002**	0.002**	0.001**	0.001**	0.002**	0.002**
	(2.90)	(3.12)	(3.47)	(3.69)	(2.87)	(3.06)	(3.47)	(3.62)
AGE	−0.131**	−0.158**	−0.192**	−0.254**	−0.137**	−0.173**	−0.194**	−0.261**
	(−8.31)	(−9.87)	(−4.30)	(−5.56)	(−8.67)	(−10.69)	(-4.35)	(−5.70)
Strategy fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	No	No	Yes	Yes	No	No
Adj R^2	0.028	0.012	0.088	0.051	0.028	0.012	0.089	0.052
Number of observations	745,903	686,277	3,121	3,364	745,903	686,277	3,121	3,364

Notes. OLS and Fama and Macbeth (1973) regressions are estimated on the cross section of hedge fund performance. The dependent variable is hedge fund monthly return (*RETURN*) or alpha (*ALPHA*), where *ALPHA* is estimated relative to the Fung and Hsieh (2004) seven-factor model. The indicator variable *FIRST* takes a value of one when a fund is the first fund launched by a firm and a value of zero otherwise, *CHRONO* is fund launch order within the firm, *SIZE* is last month fund assets under management in millions of US$, *MGTFEE* is fund management fee in percentage, *PERFFEE* is fund performance fee in percentage, *NOTICE* is fund redemption notice period in months, and *AGE* is fund age in decades. The regressions include controls for fund investment style fixed effects and calendar year fixed effects (for the OLS regressions). The *t*-statistics are in parentheses. For the OLS regressions, they are derived from robust standard errors that are clustered by fund, and for the Fama-MacBeth regressions, they are derived from Newey and West (1987) standard errors with a three-month lag. The sample period is from January 1994 to December 2013.

*Significant at the 5% level; **significant at the 1% level.

sensitivity is computed using the past rolling 36 months of flow and return data. Agarwal et al. (2009) argue that performance fees and manager deltas help align managers' interests with those of their investors. We contend that funds with higher flow-performance sensitivity also have greater incentive alignment. The results reported in panels B, C, and D of Table 6 are broadly consistent with the agency view. First funds outperform follow-on funds more for funds with below-median or low weights on performance fee than for funds with above-median or high weights on performance fee. Similarly, the performance spread between first and follow-on funds tends to be larger for funds with low manager total deltas than for funds with high manager total deltas. Moreover, the underperformance of follow-on funds is greater for funds with low flow-performance sensitivity than for those with high flow-performance sensitivity.

3.3. Tests of Hedge Fund Firm Performance

Do investors benefit when hedge fund firms deliver superior performance with their first funds and subsequently raise capital via follow-on funds? It is not clear whether the superior performance of the first fund more than compensates for the inferior performance of the follow-on funds launched by a hedge fund firm. To investigate, we estimate the Equation (3) OLS and Fama-MacBeth regressions with the independent variable *NFUNDS* in addition to *FIRST*.[20] The variable *NFUNDS* is the number of funds launched by the hedge fund firm. The multivariate regression results reported in columns (1)–(4) of Table 7 are consistent with the asset-gathering view in which hedge fund firms with successful first funds take advantage of their stellar track records and raise follow-on funds that subsequently underperform. The coefficient estimates on *NFUNDS* are negative and statistically significant at the 1% or 5% level for all regression specifications.

The asset-gathering view further predicts that, in order to grow capital aggressively, firms will offer funds in multiple divergent investment strategies to cater to an investor preference for diversification (Massa 2003). To test this view, estimate

Table 6. Regressions on Hedge Fund Performance for Funds Stratified by Incentive Alignment

	Dependent variable							
	OLS		Fama-MacBeth		OLS		Fama-MacBeth	
	RETURN	*ALPHA*	*RETURN*	*ALPHA*	*RETURN*	*ALPHA*	*RETURN*	*ALPHA*
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Funds sorted by personal capital								
	Personal capital				Without personal capital			
FIRST	0.040	0.018	0.107*	0.039	0.120**	0.114**	0.155**	0.123**
	(0.77)	(0.34)	(2.07)	(1.06)	(3.50)	(3.26)	(3.25)	(3.13)
Panel B: Funds sorted by performance fee to management fee ratio								
	High performance fees relative to management fees				Low performance fees relative to management fees			
FIRST	0.164**	0.131**	0.133**	0.095**	0.229**	0.227**	0.146**	0.151**
	(7.19)	(5.76)	(5.41)	(4.30)	(8.51)	(8.63)	(3.85)	(4.62)
Panel C: Funds sorted by past manager total delta								
	High manager total delta				Low manager total delta			
FIRST	0.125**	0.097**	0.145**	0.099**	0.139**	0.160**	0.112**	0.126**
	(5.33)	(4.54)	(5.17)	(4.74)	(5.58)	(6.66)	(4.50)	(5.46)
Panel D: Funds sorted by past 36-month flow-performance sensitivity								
	High flow-performance sensitivity				Low flow-performance sensitivity			
FIRST	0.083**	0.113**	0.072*	0.088**	0.138**	0.159**	0.144**	0.157**
	(2.95)	(4.65)	(2.37)	(2.95)	(4.52)	(5.95)	(3.16)	(3.80)

Notes. OLS and Fama and Macbeth (1973) regressions are estimated on the cross-section of hedge fund performance for funds stratified by proxies for incentive alignment. The dependent variable is hedge fund monthly return (*RETURN*) or alpha (*ALPHA*), where *ALPHA* is estimated relative to the Fung and Hsieh (2004) seven-factor model. The indicator variable *FIRST* takes a value of one when a fund is the first fund launched by a firm and a value of zero otherwise. The independent variables are *MGTFEE*, *PERFFEE*, *NOTICE*, log(*SIZE*), and *AGE*, where *MGTFEE* is fund management fee in percentage, *PERFFEE* is fund performance fee in percentage, *NOTICE* is fund redemption notice period in months, *SIZE* is last month fund assets under management in millions of US$, and *AGE* is fund age in decades. The OLS regressions include controls for fund investment style and calendar year fixed effects. The *t*-statistics are in parentheses. For the OLS regressions, they are derived from robust standard errors that are clustered by fund, and for the Fama-MacBeth regressions, they are derived from Newey and West (1987) standard errors with a three-month lag. The coefficient estimates on the control variables are omitted for brevity. In panel A, funds are sorted based on manager personal capital. In panel B, funds are sorted based on whether their weights on performance fee, that is, performance fee/management fee are higher or lower than the median that year. In panel C, funds are sorted based on whether their manager total deltas (Agarwal et al. 2009) computed at the end of the previous year are higher or lower than the median. In panel D, funds are sorted based on whether their flow-performance sensitivities estimated over the last 36 months are higher or lower than the median. Columns (1)–(4) report results for funds with stronger incentive alignment. Columns (5)–(8) report results for funds with weaker incentive alignment. The sample period is from January 1994 to December 2013.

*Significant at the 5% level; **significant at the 1% level.

the Equation (3) OLS and Fama-MacBeth regressions with the independent variable *STRATCORR* in addition to *FIRST*. The variable *STRATCORR* is the average pairwise correlation of the strategies engaged by the firm. The advantage of analyzing strategy divergence as opposed to the number of strategies within each firm is that we avoid commingling firms that engage in multiple but similar investment strategies with firms that pursue multiple and divergent investment strategies. The latter is more consonant with a growth-oriented asset-gathering strategy that caters to an investor preference for diversification.

The results reported in columns (5)–(8) of Table 7 indicate that firms managing divergent strategies

Table 7. Regressions on Hedge Fund Performance with Firm Variables

	Dependent variable							
	OLS		Fama-MacBeth		OLS		Fama-MacBeth	
	RETURN	*ALPHA*	*RETURN*	*ALPHA*	*RETURN*	*ALPHA*	*RETURN*	*ALPHA*
Independent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NFUNDS	−0.006**	−0.009**	−0.009*	−0.011**				
	(−10.45)	(−13.85)	(−2.12)	(−3.81)				
STRATCORR					0.268**	0.267**	0.274**	0.244**
					(4.85)	(4.62)	(3.21)	(4.02)
FIRST	0.103**	0.096**	0.089**	0.083**	0.109**	0.120**	0.095**	0.104**
	(6.93)	(6.43)	(5.33)	(5.35)	(6.75)	(7.37)	(4.73)	(5.74)
log(*SIZE*)	−0.037**	−0.017**	−0.041**	−0.02*	−0.036**	−0.017**	−0.041**	−0.020*
	(−8.64)	(−4.04)	(−3.78)	(−2.42)	(−8.36)	(−3.82)	(−3.79)	(−2.41)
MGTFEE	0.037**	0.057**	0.041	0.061**	0.033**	0.051**	0.038	0.054*
	(3.15)	(4.71)	(1.85)	(2.78)	(2.82)	(4.16)	(1.69)	(2.47)
PERFFEE	0.008**	0.017**	0.007*	0.014**	0.009**	0.019**	0.007*	0.014**
	(6.67)	(13.53)	(2.15)	(5.80)	(7.37)	(14.43)	(2.20)	(5.88)
NOTICE	0.001**	0.001**	0.002**	0.001**	0.001**	0.001**	0.002**	0.002**
	(2.73)	(2.91)	(3.29)	(3.40)	(2.78)	(3.02)	(3.30)	(3.52)
AGE	−0.130**	−0.156**	−0.181**	−0.241**	−0.126**	−0.153**	−0.187**	−0.249**
	(−8.26)	(−9.83)	(−4.13)	(−5.43)	(−8.09)	(−9.65)	(−4.11)	(−5.39)
Strategy fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	No	No	Yes	Yes	No	No
Adj R^2	0.028	0.012	0.089	0.053	0.028	0.012	0.089	0.051
Number of observations	7,45,903	6,86,277	3,121	3,364	7,45,865	6,86,239	3,121	3,364

Notes. OLS and Fama and Macbeth (1973) regressions are estimated on the cross-section of hedge fund performance. The dependent variable is hedge fund monthly return (*RETURN*) or alpha (*ALPHA*), where *ALPHA* is estimated relative to the Fung and Hsieh (2004) seven-factor model. The independent variables include *NFUNDS*, *STRATCORR*, *FIRST*, log(*SIZE*), *MGTFEE*, *PERFFEE*, *NOTICE*, and *AGE*, where *NFUNDS* is the number of funds launched by the firm, *STRATCORR* is the average pairwise correlation of the strategies that the fund's firm engages in, *FIRST* is an indicator variable that takes a value of one when a fund is the first fund launched by a firm and a value of zero otherwise, *SIZE* is last month fund assets under management in millions of US$, *MGTFEE* is fund management fee in percentage, *PERFFEE* is fund performance fee in percentage, *NOTICE* is fund redemption notice period in months, and *AGE* is fund age in decades. The regressions also include controls for fund investment style fixed effects and calendar year fixed effects (for the OLS regressions). The *t*-statistics are in parentheses. For the OLS regressions, they are derived from robust standard errors that are clustered by fund, whereas for the Fama-MacBeth regressions, they are derived from Newey and West (1987) standard errors with a three-month lag. The sample period is from January 1994 to December 2013.

*Significant at the 5% level; **significant at the 1% level.

underperform firms managing correlated strategies. The coefficient estimates on *STRATCORR* are positive and statistically significant at the 1% level across all regression specifications. These findings dovetail with the asset-gathering view.

3.4. Tests of Hedge Fund Firm Revenue

How does raising multiple funds affect the total fee revenue that accrues to the firm management company? To investigate, we sort firms into five portfolios based on the number of funds launched. Next, we evaluate the total firm fee revenue (management fee plus performance fee) over the subsequent one-year period. Fund performance fee is calculated per the assumptions in appendix A of Agarwal et al. (2009).

We find that hedge fund management companies benefit significantly from launching multiple funds or products. Multiple-product firms in portfolio 5 (firms with many funds) harvest an annual fee revenue of US$25.50 million, which is US$21.68 million greater than that harvested by the average single-product firm in portfolio 1 (firms with one fund). The difference in fee revenues is statistically significant at the 1% level.[21] On average, firms in portfolio 5 manage US$866.44 million, whereas firms in portfolio 1 manage only US$95.37 million. The AUM spread may therefore drive much of the fee revenue difference.

To test whether the higher fee revenues of multiple-product firms are indeed by-products of their greater AUMs, we perform a double sort on firm AUM and on the number of funds launched. The results indicate that the multiple-product growth strategy engenders greater fee revenues largely through its effect on firm AUM. Once we control for firm AUM, the spread in fee revenues between multiple- and single-product firms is typically insignificant. The spread in fee revenues is only significant for the firms in the largest AUM quintile.

Taken together, these results suggest that hedge fund firms (not investors) benefit from the multiple-product growth strategy. Unsurprisingly, we find that this has

become the dominant business model for hedge fund firms. At the start of our sample period, multiple-product firms manage 47.14% of funds (by number) and 62.56% of industry assets. By the end of the sample period, multiple-product firms manage 68.94% of funds (by number) and 77.19% of industry assets.

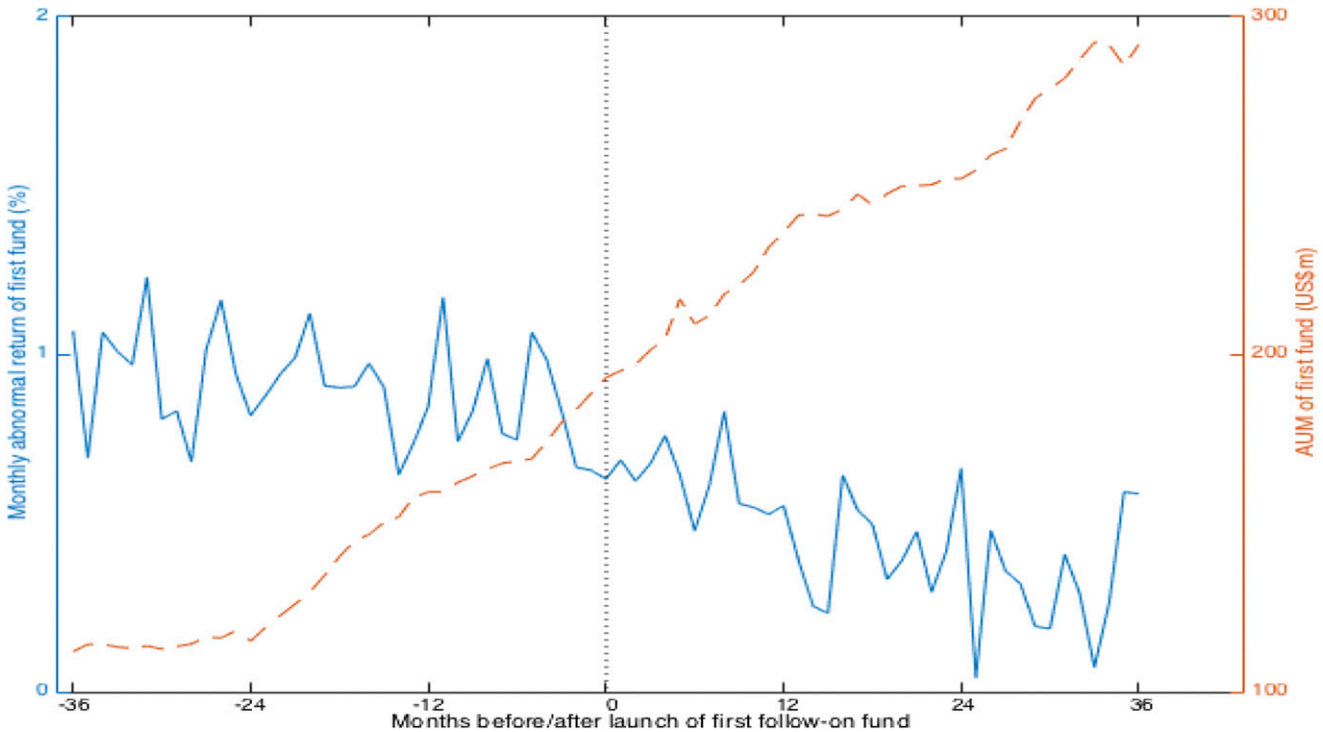
3.5. Event Study

Do firms protect the performance of their first funds while simultaneously operating other follow-on funds? To investigate, we first plot the monthly abnormal returns of the average first fund 36 months before to 36 months after the launch of the first follow-on fund by the same firm. To accommodate the 36-month window, the fund sample we analyze only includes first funds whose firms raised a subsequent fund between January 1997 and December 2010 and that report returns in the 24-month period before and in the 24-month period after the launch of the follow-on fund.

The resultant graph in Figure 2 suggests that first fund performance deteriorates once the firm launches a subsequent fund. The average annual first fund risk-adjusted return prior to the follow-on fund launch is 10.83%, whereas the analogous return after the follow-on fund launch is 5.48%. This implies that first fund performance deteriorates by 5.35% once the firm launches another fund. In Figure 2, we also plot the AUM of the average first fund over the same event window. We find that, despite the deterioration in first fund performance, the average first fund is able to increase its AUM by 51% from US$193 million to US$292 million in the 36-month period after the launch of the first follow-on fund by the same firm. This represents a substantial increase in AUM on the back of a 72% growth in AUM from US$112 million to US$193 million over the 36-month period prior to the launch.

To account for endogeneity concerns driven by observable differences between firms that launch follow-on funds and firms that do not, we match event hedge funds with nonevent hedge funds based on fund performance, AUM, and fee revenue in the 24-month pre-launch period and conduct a difference-in-differences analysis. For example, in the fund abnormal return or alpha analysis, event funds are matched to nonevent funds by minimizing the sum of the absolute differences in monthly fund abnormal return in the 24-month pre-launch period. Table 8 reports differences in fund return, alpha, AUM, and fee revenue before and after the launch of the first follow-on fund relative to the matched sample. The results reported in panels A–D

Figure 2. (Color online) Average Monthly Abnormal Return and Assets Under Management of First Funds Before and After Launch of the First Follow-on Fund by the Same Firm



Notes. Monthly abnormal return is the difference between a portfolio's excess return and its factor loadings multiplied by risk factors from the Fung and Hsieh (2004) seven-factor model. Factor loadings are estimated over the entire sample period. For each hedge fund firm, the first fund is the first fund launched by the firm. First fund abnormal returns and assets under management (AUM) are averaged across firms. The sample includes firms that launch at least one follow-on fund from January 1997 to December 2013. Month 0 denotes the inception month for the first follow-on fund managed by the same firm. The abnormal return graph is represented by the solid line (y-axis on the left), whereas the AUM graph is represented by the dashed line (y-axis on the right). The sample period is from January 1994 to December 2013.

Table 8. Event Study with Differences-in-Differences Analysis

	Before	After	Difference (after – before)	*t*-statistic of difference
Fund attribute	(1)	(2)	(3)	(4)
Panels A–D: Control funds matched based on monthly returns, alpha, AUM, or fee revenue				
Panel A: First fund return				
Fund return (percent/month), treatment group	1.41	0.81	–0.60**	–13.17
Fund return (percent/month), control group	1.17	0.72	–0.45**	–9.83
Difference in return (percent/month)	0.25	0.09	–0.16**	–4.24
Panel B: First fund alpha				
Fund alpha (percent/month), treatment group	0.90	0.46	–0.45**	–11.27
Fund alpha (percent/month), control group	0.64	0.35	–0.29**	–7.52
Difference in alpha (percent/month)	0.26	0.10	–0.16**	–4.36
Panel C: First fund AUM				
Fund AUM (US$m), treatment group	140.31	245.93	105.62**	59.97
Fund AUM (US$m), control group	137.90	217.31	79.41**	59.77
Difference in AUM (US$m)	2.41	28.61	26.21**	14.16
Panel D: First fund fee revenue				
Fund fee revenue (US$m/year), treatment group	5.71	9.01	3.30**	44.88
Fund fee revenue (US$m/year), control group	5.76	8.26	2.50**	23.52
Difference in fee revenue (US$m/year)	–0.05	0.75	0.80**	6.97
Panels E–H: Control funds matched based on fund age and monthly returns, alpha, AUM, or fee revenue				
Panel E: First fund return				
Fund return (percent/month), treatment group	1.41	0.81	–0.60	–13.17
Fund return (percent/month), control group	1.11	0.66	–0.46	–11.47
Difference in return (percent/month)	0.30	0.15	–0.15**	–3.70
Panel F: First fund alpha				
Fund alpha (percent/month), treatment group	0.90	0.46	–0.45	–11.27
Fund alpha (percent/month), control group	0.63	0.32	–0.30	–10.48
Difference in alpha (percent/month)	0.27	0.13	–0.14**	–3.62
Panel G: First fund AUM				
Fund AUM (US$m), treatment group	140.31	245.93	105.62	59.97
Fund AUM (US$m), control group	117.34	197.70	80.36	62.07
Difference in AUM (US$m)	22.97	48.22	25.25**	15.59
Panel H: First fund fee revenue				
Fund fee revenue (US$m/year), treatment group	5.71	9.01	3.30	44.88
Fund fee revenue (US$m/year), control group	4.27	7.40	3.14	31.08
Difference in fee revenue (US$m/year)	1.44	1.61	0.16	1.59

Notes. This table reports results from an event study analysis of first fund attributes around the launch of the first follow-on fund by the same hedge fund firm. First funds are the first funds launched by each hedge fund firm. The fund attributes analyzed include fund return, alpha, AUM, and fee revenue. Alpha is estimated relative to the Fung and Hsieh (2004) seven-factor model. Event month is the month that the first follow-on fund is launched. The period "before" is the 36-month period before the event month, and the period "after" is the 36-month period after the event month. To be included in the analysis, a first fund must survive at least 24 months before and after the event month. In panels A, B, C, and D, funds in the control group are matched to funds in the treatment group based on fund return, alpha, AUM, or fee revenue in the 24-month pre-event period. For example, in the fund return analysis, funds in the control group are matched to funds in the treatment group by minimizing the sum of the absolute differences in monthly fund return in the 24-month pre-event period. In panels E, F, G, and H, funds in the control group are first matched to funds in the treatment group based on minimizing the absolute difference in calendar years since inception. Next, funds in the closest calendar year group are matched to the treatment group based on fund return, alpha, AUM, or fee revenue in the 24-month pre-event period. The *t*-statistics are derived from White (1980) standard errors. The sample period is from January 1994 to December 2013.

*Significant at the 5% level; **significant at the 1% level.

of Table 8 indicate that, relative to the matched sample, first fund annualized return and alpha fall by 1.92% after the launch of the first follow-on fund. At the same time, relative to comparable funds, first fund AUM and fee revenue increase by US$26.21 million and US$0.80 million per annum, respectively.

There are concerns that the aforementioned matching criterion may not be adequate. For example, Aggarwal and Jorion (2010) show that hedge fund performance may be a function of fund age. Therefore, we also match event hedge funds with nonevent hedge funds based on fund age, in addition to fund performance, AUM, or fee revenues. Specifically, in the fund abnormal return analysis, event funds are matched to nonevent funds by minimizing the absolute difference in calendar years since inception. If there are multiple matches based on fund age, we choose the matching fund that minimizes the sum of the absolute differences in monthly fund abnormal return in the 24-month prelaunch period. The results largely survive this modified matching algorithm. Relative to the matched sample based on fund age and performance, first fund annualized return and alpha fall by 1.80% and 1.68%, respectively, after the launch of the first follow-on fund.

Are the results specific to the launch of the *first* follow-on fund? That is, do the launches of subsequent follow-on funds also coincide with deteriorations in the performance of the first fund? To test, we redo the difference-in-differences analysis for the launch of the second or later follow-on funds and report the findings in panels A–D of Table 9. The results indicate that first fund performance deteriorates when a firm launches its second and later follow-on funds as well, although the deteriorations tend to be smaller in magnitude for each successive follow-on fund launched. Moreover, although first funds grow their AUMs and fee revenues around the launch of each later follow-on fund, the increase is lower than that experienced by other matching first funds that do not launch later follow-on funds.

What drives the drop in first fund performance after a firm launches its first follow-on fund? First, the first funds at firms that launch subsequent funds may be simply lucky and their performance mean reverts once their luck runs out. Second, partners at firms that launch follow-on funds may be busy managing those follow-on funds and cannot devote as much of their time to driving the investment process at the first fund. Third, follow-on funds may crowd out the investment opportunities at first funds, especially if the former are engaged in the same strategies as the latter. We argue that the evidence of first fund performance persistence around the launch of the first follow-on fund by the same firm discussed in the next section is inconsistent with the first story.

To explore the second story, we divide first funds into first funds managed by the same principals (group I) and different principals (group II) as those at the first follow-on funds in the same firm and redo the event study analysis. The results reported in panels E–H of Table 9 indicate that the performance deterioration for group I is greater than that for group II. These results are consonant with the view that limited attention explains some of the deterioration in first fund performance.

To test the third story, we stratify first funds into those that engage in the same strategies (group III) and different strategies (group IV) as the first follow-on funds from the same firm and redo the event study analysis. The results reported in panels I–L of Table 9 indicate that the performance deterioration for group III is more pronounced than that for group IV. These results are supportive of the view that the crowding out effect explains part of the deterioration in first fund performance.[22]

3.6. Intrafirm Performance Spillovers

Are firms with first funds that delivered stellar performance skilled or simply lucky? One view is that these firms are simply growing capital opportunistically in the wake of a lucky run at the first fund. However, that view necessarily calls into question the rationality of hedge fund investors who subscribe to the first and follow-on funds launched by such firms.

To investigate, we test the relation between first fund performance prior to the launch of the first follow-on fund and the performance of the follow-on fund postinception. Specifically, we estimate the following regression on first follow-on fund performance:

$$\begin{aligned} NFIRSTALPHA_{im,m+11} = {} & a + bFIRSTALPHA_{im-12,m-1} \\ & + c\log(NFIRSTSIZE_{im}) \\ & + dNFIRSTMGTFEE_i \\ & + eNFIRSTPERFFEE_i \\ & + fNFIRSTNOTICE_i \\ & + \sum_k g^k NFIRSTSTYLEDUM_i^k \\ & + \sum_y h^y YEARDUM_m^y + \epsilon_{im}, \end{aligned} \tag{4}$$

where m is the first follow-on fund inception month, $NFIRSTALPHA_{im,m+11}$ is follow-on fund abnormal return averaged over the 12-month postinception period, $FIRSTALPHA_{im-12,m-1}$ is first fund abnormal return averaged over the 12-month preinception period, $NFIRSTSIZE_{im}$ is follow-on fund size in millions of US$ at fund inception, $NFIRSTMGTFEE_i$ is follow-on fund management fee in percentage, $NFIRSTPERFFEE_i$ is follow-on fund performance fee in percentage,

Table 9. Event Study, Additional Analyses

	Before	After	Difference (after – before)	*t*-statistic of difference	Before	After	Difference (after – before)	*t*-statistic of difference
Fund attribute	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panels A–D: Launch of the second or later follow-on fund								
	Second follow-on fund launch				Third or later follow-on fund launch			
Panel A: First fund return								
Fund return (percent/month), treatment group	1.31	0.75	−0.56**	−9.32	1.14	0.70	−0.44**	−7.16
Fund return (percent/month), control group	1.11	0.72	−0.39**	−7.80	1.09	0.69	−0.40**	−8.98
Difference in return (percent/month)	0.20	0.03	−0.17**	−4.07	0.05	0.01	−0.04	−0.94
Panel B: First fund alpha								
Fund alpha (percent/month), treatment group	0.85	0.39	−0.47**	−10.10	0.64	0.29	−0.36**	−6.31
Fund alpha (percent/month), control group	0.68	0.36	−0.32**	−9.40	0.57	0.33	−0.24**	−4.88
Difference in alpha (percent/month)	0.17	0.03	−0.15**	−4.00	0.08	−0.04	−0.12**	−3.19
Panel C: First fund AUM								
Fund AUM (US$m), treatment group	200.00	300.14	100.14**	109.56	295.69	445.32	149.63**	43.64
Fund AUM (US$m), control group	198.15	319.17	121.02**	39.26	295.35	504.06	208.71**	28.83
Difference in AUM (US$m)	1.85	−19.03	−20.88**	−7.07	0.34	−58.74	−59.08**	−5.82
Panel D: First fund fee revenue								
Fund fee revenue (US$m/year), treatment group	8.36	11.47	3.11**	14.40	12.70	15.81	3.10**	10.77
Fund fee revenue (US$m/year), control group	8.18	12.05	3.87**	22.37	12.02	17.95	5.93**	28.82
Difference in fee revenue (US$m/year)	0.17	−0.58	−0.75**	−2.79	0.68	−2.14	−2.82**	−10.73
Panels E–H: First funds that are managed by the same/different principals as the first follow-on funds from the same firm.								
	Same principals				Different principals			
Panel E: First fund return								
Fund return (percent/month), treatment group	1.53	0.85	−0.69**	−6.60	1.27	0.84	−0.43**	−4.19
Fund return (percent/month), control group	1.24	0.79	−0.45**	−5.70	1.00	0.72	−0.28*	−2.59
Difference in return (percent/month)	0.29	0.06	−0.23**	−3.00	0.26	0.12	−0.14	−1.77
Panel F: First fund alpha								
Fund alpha (percent/month), treatment group	0.99	0.49	−0.50**	−6.17	0.82	0.49	−0.32**	−3.63
Fund alpha (percent/month), control group	0.64	0.37	−0.27**	−3.83	0.61	0.35	−0.25**	−3.35
Difference in alpha (percent/month)	0.35	0.12	−0.23**	−2.76	0.21	0.14	−0.07	−0.97
Panel G: First fund AUM								
Fund AUM (US$m), treatment group	55.30	122.83	67.54**	23.15	217.62	320.08	102.46**	16.55
Fund AUM (US$m), control group	54.90	94.38	39.48**	38.53	210.66	278.60	67.95**	25.19
Difference in AUM (US$m)	0.40	28.45	28.05**	8.03	6.97	41.47	34.51**	7.74

Table 9. (Continued)

Fund attribute	Before (1)	After (2)	Difference (after – before) (3)	*t*-statistic of difference (4)	Before (5)	After (6)	Difference (after – before) (7)	*t*-statistic of difference (8)
Panel H: First fund fee revenue								
Fund fee revenue (US$m/year), treatment group	2.84	5.48	2.64**	13.86	8.82	12.10	3.27**	12.93
Fund fee revenue (US$m/year), control group	3.14	5.77	2.64**	6.18	8.03	9.08	1.04**	4.43
Difference in fee revenue (US$m/year)	–0.30	–0.30	0.01	0.02	0.79	3.02	2.23**	5.32
Panels I–L: First funds that are engage in the same/different strategies as the first follow-on funds from the same firm.								
	Same strategies				Different strategies			
Panel I: First fund return								
Fund return (percent/month), treatment group	1.52	0.84	–0.69**	–12.03	1.26	0.77	–0.49**	–5.99
Fund return (percent/month), control group	1.23	0.73	–0.50**	–8.69	1.08	0.70	–0.38**	–6.09
Difference in return (percent/month)	0.29	0.10	–0.19**	–3.88	0.18	0.07	–0.11	–1.64
Panel J: First fund alpha								
Fund alpha (percent/month), treatment group	0.98	0.48	–0.50**	–10.92	0.79	0.43	–0.37**	–5.06
Fund alpha (percent/month), control group	0.69	0.37	–0.32**	–6.99	0.57	0.33	–0.25**	–4.67
Difference in alpha (percent/month)	0.29	0.10	–0.19**	–4.13	0.22	0.10	–0.12*	–2.06
Panel K: First fund AUM								
Fund AUM (US$m), treatment group	146.35	236.27	89.91**	41.64	132.16	259.22	127.06**	58.56
Fund AUM (US$m), control group	139.06	224.93	85.87**	81.21	136.22	206.69	70.47**	29.88
Difference in AUM (US$m)	7.30	11.34	4.04	1.87	–4.06	52.53	56.59**	20.85
Panel L: First fund fee revenue								
Fund fee revenue (US$m/year), treatment group	5.35	8.22	2.87**	48.05	6.20	10.09	3.89**	30.67
Fund fee revenue (US$m/year), control group	5.21	7.34	2.13**	15.03	6.50	9.51	3.00**	8.55
Difference in fee revenue (US$m/year)	0.14	0.88	0.74**	5.76	–0.30	0.58	0.89*	2.31

Notes. This table reports results from an event study analysis of first fund attributes around the launch of the first (or later) follow-on fund by the same hedge fund firm. First funds are the first funds launched by each hedge fund firm. The fund attributes analyzed include fund return, alpha, AUM, and fee revenue. Alpha is estimated relative to the Fung and Hsieh (2004) seven-factor model. Event month is the month that the first follow-on fund is launched. The period "before" is the 36-month period before the event month, and the period "after" is the 36-month period after the event month. To be included in the analysis, a first fund must survive at least 24 months before and after the event month. Funds in the control group are matched to funds in the treatment group based on fund return, alpha, AUM, or fee in the 24-month pre-event period. For example, in the fund return analysis, funds in the control group are matched to funds in the treatment group by minimizing the sum of the absolute differences in monthly fund return in the 24-month pre-event period. Panels A–D report first fund performance, AUM, and fee revenue around the launch of the second or later follow-on fund. Panels E–L report first fund performance, AUM, and fee revenue around launch of the first follow-on fund. In addition, panels E–H include observations from first funds that are managed by the same principals (Columns (1)–(4)) or different principals (Columns (5)–(8)) as the first follow-on funds from the same firm. Panels I–L include observations from first funds that engage in the same strategy (Columns (1)–(4)) or different strategy (Columns (5)–(8)) as the first follow-on funds from the same firm. The *t*-statistics are derived from White (1980) standard errors. The sample period is from January 1994 to December 2013.

*Significant at the 5% level; **significant at the 1% level.

$NFIRSTNOTICE_i$ is follow-on fund redemption notification period in months, $NFIRSTSTYLEDUM_i^k$ is follow-on fund style dummy for style k, and $YEARDUM_m^y$ is follow-on fund inception year dummy for year y. We estimate the univariate version of the regression as well as two other versions where fund abnormal returns are averaged over 24 and 36 months instead of over 12 months. Statistical inferences are based on White (1980) heteroskedasticity-consistent standard errors clustered at the firm level. The coefficient estimates reported in columns (1)–(6) of Table A.2 in the online appendix suggest that fund risk-adjusted performance persists within hedge fund firms. A one percentage point increase in first fund monthly alpha in the 12-month period prior to the launch of the first follow-on fund is associated with a 13.6 basis point increase in follow-on fund monthly alpha in the 12-month postlaunch period that is statistically significant at the 1% level. After controlling for other variables that can explain follow-on fund performance, the coefficient estimate on first fund alpha decreases by about a third but is still statistically significant at the 1% level. We obtain similar results when investigating alpha or abnormal returns averaged over 24 months. When abnormal returns are averaged over 36 months, the coefficient estimates on *FIRSTALPHA* are significantly weaker and not always statistically distinguishable from zero at the 5% level.

To investigate persistence in first fund performance, we estimate the following regression:

$$\begin{aligned} FIRSTALPHA_{im,m+11} = {} & a + bFIRSTALPHA_{im-12,m-1} \\ & + c\log(FIRSTSIZE_{im-1}) \\ & + dFIRSTMGTFEE_i \\ & + eFIRSTPERFFEE_i \\ & + fFIRSTNOTICE_i \\ & + \sum_k g^k FIRSTSTYLEDUM_i^k \\ & + \sum_y h^y YEARDUM_m^y + \epsilon_{im}, \end{aligned} \quad (5)$$

where m is the first follow-on fund inception month, $FIRSTSIZE_{im-1}$ is first fund size in millions of US$, $FIRSTMGTFEE_i$ is first fund management fee in percentage, $FIRSTPERFFEE_i$ is first fund performance fee in percentage, $FIRSTNOTICE_i$ is first fund redemption notification period in months, $FIRSTSTYLEDUM_i^k$ is first fund style dummy for style k, and $YEARDUM_m^y$ is follow-on fund inception year dummy for year y. We estimate the univariate version of the regression as well as two other versions where fund abnormal returns are averaged over 24 and 36 months instead of over 12 months.

The coefficient estimates reported in columns (7)–(12) of Table A2 indicate that first fund performance persists around the launch of the first follow-on fund. A one percentage point increase in first fund monthly alpha in the 12-month period prior to follow-on fund launch is associated with a 12.6 basis point increase in first fund monthly alpha in the 12-month period after the follow-on fund launch. The coefficient estimate is statistically significant at the 1% level and prevails after controlling for the other factors that explain first fund performance. In addition, the findings are robust to extending the evaluation horizon to 24 or 36 months. Therefore, firms with stellar first fund performance are not simply lucky. Investors who subscribe to the first and follow-on funds managed by such firms are rationally responding to the view that they employ talented investment professionals.

3.7. Blowback Effect

Are there constraints on the amount of capital that hedge fund firms can raise when adopting a multiple-product growth strategy? We test for evidence of a feedback or blowback effect from follow-on funds to first funds by estimating the following regression on first fund flow:

$$\begin{aligned} FIRSTFLOW_{im} = {} & a + bFIRSTALPHA_{im-12,m-1} \\ & + cFIRSTFLOW_{im-12,m-1} \\ & + dFIRSTVOL_{im-12,m-1} \\ & + eFIRSTHWM_i \\ & + fNFIRSTALPHA_{im-12,m-1} \\ & + gNFIRSTFLOW_{im-12,m-1} \\ & + hNFIRSTVOL_{im-12,m-1} \\ & + \sum_k l^k FIRSTSTYLEDUM_i^k \\ & + \sum_y o^y YEARDUM_m^y + \epsilon_{im}, \end{aligned} \quad (6)$$

where $FIRSTFLOW_{im}$ is flow into first fund i on month m, $FIRSTALPHA_{im-12,m-1}$ is first fund i abnormal return averaged over the previous 12 months, $FIRSTVOL_{im-12,m-1}$ is standard deviation of first fund i abnormal return estimated over the previous 12 months, $FIRSTHWM_i$ is first fund i high water-mark indicator, $NFIRSTALPHA_{im-12,m-1}$ is follow-on fund abnormal return averaged over all follow-on funds managed by the firm that launched fund i and averaged over the previous 12 months, $NFIRSTFLOW_{im-12,m-1}$ is follow-on fund flow averaged over all follow-on funds managed by the firm that launched fund i and averaged over the previous 12 months, $NFIRSTVOL_{im-12,m-1}$ is standard deviation of average follow-on fund i abnormal return estimated over the previous 12 months,

Table 10. Regressions on First Fund Flow

	Dependent variable		
	FLOW		
	12-month lookback period	24-month lookback period	36-month lookback period
Independent variable	(1)	(2)	(3)
FIRSTALPHA	0.743**	0.807**	0.873**
	(12.81)	(9.72)	(8.82)
FIRSTFLOW	0.263**	0.214**	0.171**
	(20.02)	(13.59)	(9.25)
FIRSTVOL	−0.077**	−0.056	−0.044
	(−2.66)	(−1.62)	(−1.17)
FIRSTHWM	−0.007	0.070	0.0465
	(−0.07)	(0.62)	(0.39)
NFIRSTALPHA	0.127**	0.170**	0.118
	(2.89)	(2.99)	(1.91)
NFIRSTFLOW	0.028**	0.010	0.002
	(3.91)	(1.33)	(0.23)
NFIRSTVOL	0.052	0.022	−0.001
	(1.57)	(0.58)	(−0.03)
Strategy fixed effects	Yes	Yes	Yes
Calendar year fixed effects	Yes	Yes	Yes
Adj R^2	0.024	0.014	0.010
Number of observations	114,079	108,863	99,930

Notes. Regressions are estimated on the flow of the first funds managed by each hedge fund firm. For each firm, we distinguish between the first fund launched and other follow-on funds. The dependent variable is first fund monthly flow (*FLOW*). The independent variables include *FIRSTALPHA*, *FIRSTFLOW*, *FIRSTVOL*, *FIRSTHWM*, *NFIRSTALPHA*, *NFIRSTFLOW*, *NFIRSTVOL*, where *FIRSTALPHA* is first fund abnormal return averaged over the last x months, *FIRSTFLOW* is first fund flow averaged over the last x months, *FIRSTVOL* is the standard deviation of first fund abnormal returns estimated over the last x months, *FIRSTHWM* is first fund high-water mark indicator, *NFIRSTALPHA* is the average abnormal return of the follow-on funds within the same firm averaged over the last x months, *NFIRSTFLOW* is the average flow into the follow-on funds within the same firm averaged over the last x months, and *NFIRSTVOL* is the standard deviation of follow-on fund abnormal returns estimated over the last x months. The independent variable of interest is *NFIRSTALPHA*. The lookback period x equals either 12, 24, or 36 months. The regressions include controls for fund investment style and calendar year fixed effects. In parentheses are the t-statistics. They are derived from robust standard errors that are clustered by firm. The sample period is from January 1994 to December 2013.

*Significant at the 5% level; **significant at the 1% level.

$FIRSTSTYLEDUM_i^k$ is first fund i style dummy for style k, and $YEARDUM_m^y$ is year dummy for year y. Statistical inferences are based on White (1980) heteroskedasticity-consistent standard errors clustered at the firm level. We also estimate regressions with lookback periods of 24 and 36 months.

The results reported in Table 10 indicate that there is a significant blowback effect from follow-on funds to first funds. Poor follow-on past performance is a reliable harbinger of lower flows into first funds. The impact of follow-on fund alpha is statistically significant at the 1% level when abnormal returns are averaged over the last 12 or 24 months. Moreover, the impact of follow-on fund alpha is economically significant. For alpha evaluated over the last 12 months, it is about 17.09% as large as the impact of first fund alpha on first fund flow. These results suggest that investors rationally impose constraints on the ability of hedge fund firms to grow via the launch of multiple products. Firms that embark on this strategy will need to balance quantity with quality when launching new funds.

3.8. Endogeneity

Does the endogeneity of a firm's growth strategy engender the underperformance of follow-on versus first funds? Systematic differences may exist between firms that conceive follow-on funds (multiple-product firms) and those that do not (single-product firms). These differences could impact both the propensity to launch follow-on funds and the performance spread between first and follow-on funds. The multivariate regression methodology that we employ in Section 3.2 allows us to ameliorate concerns that observed differences between funds managed by single- and multiple-product firms explain our results.

Still, the multivariate regressions leave open the possibility that unobserved differences between funds managed by single- and multiple-product firms might simultaneously affect the decision to embark on a multiple-product growth strategy and the first versus follow-on fund performance spread. To address this concern, we conduct an instrumental variables analysis. The instrument that we use, that is, firm strategy flow at founding, is motivated by the choice of Asker

Table 11. Robustness Tests

Portfolio	Excess return (percent / year) (1)	*t*-statistic of excess return (2)	Alpha (percent / year) (3)	*t*-statistic of alpha (4)
Panel A: Adjusted for backfill bias				
Portfolio A (1st funds)	4.61**	2.61	1.28	1.42
Portfolio B (2nd to 5th fund launched)	3.96*	2.52	0.93	1.03
Portfolio C (6th to 10th fund launched)	2.79	1.66	–0.4	–0.34
Portfolio D (11th to 20th fund launched)	–0.44	–0.20	–3.98*	–2.27
Spread (A – D)	5.04**	3.60	5.26**	3.68
Panel B: Adjusted for serial correlation				
Portfolio A (1st funds)	7.97**	5.25	4.99**	5.73
Portfolio B (2nd to 5th fund launched)	6.37**	3.96	3.20**	3.03
Portfolio C (6th to 10th fund launched)	5.97**	3.29	2.51	1.95
Portfolio D (11th to 20th fund launched)	5.25**	2.60	1.50	0.97
Spread (A – D)	2.72**	2.84	3.49**	3.70
Panel C: Prefee returns				
Portfolio A (1st funds)	12.52**	8.87	9.79**	12.10
Portfolio B (2nd to 5th fund launched)	10.32**	6.92	7.44**	7.50
Portfolio C (6th to 10th fund launched)	9.48**	5.71	6.36**	5.41
Portfolio D (11th to 20th fund launched)	8.17**	4.55	4.77**	3.52
Spread (A – D)	4.35**	5.28	5.01**	6.17
Panel D: Adjusted for dynamic risk exposures using 36-month rolling betas				
Portfolio A (1st funds)	7.97**	5.00	5.01**	5.30
Portfolio B (2nd to 5th fund launched)	6.32**	3.82	2.97**	2.67
Portfolio C (6th to 10th fund launched)	5.91**	3.21	2.60	1.90

Portfolio	Excess return (percent / year) (5)	*t*-statistic of excess return (6)	Alpha (percent / year) (7)	*t*-statistic of alpha (8)
Panel G: Fung and Hsieh (2004) model augmented with the Pástor and Stambaugh (2003) liquidity factor				
Portfolio A (1st funds)	7.99**	5.75	4.94**	6.24
Portfolio B (2nd to 5th fund launched)	6.35**	4.31	3.08**	3.10
Portfolio C (6th to 10th fund launched)	5.94**	3.61	2.31*	1.96
Portfolio D (11th to 20th fund launched)	5.20**	2.91	1.38	1.00
Spread (A – D)	2.79**	3.41	3.56**	4.24
Panel H: Adjusted for fund termination				
Portfolio A (1st funds)	6.86**	4.96	4.19**	5.32
Portfolio B (2nd to 5th fund launched)	5.15**	3.53	2.34*	2.40
Portfolio C (6th to 10th fund launched)	4.78**	2.94	1.72	1.50
Portfolio D (11th to 20th fund launched)	4.34*	2.45	0.99	0.75
Spread (A – D)	2.51**	3.09	3.19**	4.00
Panel I: Subsample analysis (January 1994 – December 2003)				
Portfolio A (1st funds)	8.88**	5.19	6.49**	7.77
Portfolio B (2nd to 5th fund launched)	7.11**	4.08	4.84**	4.59
Portfolio C (6th to 10th fund launched)	6.68**	3.36	4.22**	3.12
Portfolio D (11th to 20th fund launched)	4.94**	2.78	3.11*	2.37
Spread (A – D)	3.93**	3.83	3.37**	3.76
Panel J: Subsample analysis (January 2004 – December 2013)				
Portfolio A (1st funds)	7.10**	3.24	3.85**	3.00
Portfolio B (2nd to 5th fund launched)	5.59*	2.35	2.02	1.30
Portfolio C (6th to 10th fund launched)	5.21*	1.98	1.40	0.77

Table 11. (Continued)

Portfolio	Excess return (percent / year) (1)	*t*-statistic of excess return (2)	Alpha (percent / year) (3)	*t*-statistic of alpha (4)	Portfolio	Excess return (percent / year) (5)	*t*-statistic of excess return (6)	Alpha (percent / year) (7)	*t*-statistic of alpha (8)
Portfolio D (11th to 20th fund launched)	5.28*	2.62	1.76	1.14	Portfolio D (11th to 20th fund launched)	5.45	1.76	0.99	0.44
Spread (A – D)	2.68**	2.99	3.24**	3.62	Spread (A – D)	1.65	1.30	2.85*	2.28
Panel E: Fung and Hsieh (2004) model augmented with an emerging markets equity factor					Panel K: Including duplicate share classes				
Portfolio A (1st funds)	7.99**	5.75	5.78**	8.86	Portfolio A (1st funds)	7.95**	5.73	5.24**	6.60
Portfolio B (2nd to 5th fund launched)	6.35**	4.31	4.08**	4.96	Portfolio B (2nd to 5th fund launched)	6.29**	4.29	3.44**	3.52
Portfolio C (6th to 10th fund launched)	5.94**	3.61	3.58**	3.77	Portfolio C (6th to 10th fund launched)	5.82**	3.54	2.74**	2.36
Portfolio D (11th to 20th fund launched)	5.20**	2.91	2.54*	2.19	Portfolio D (11th to 20th fund launched)	5.01**	2.81	1.64	1.23
Spread (A – D)	2.79**	3.41	3.23**	4.21	Spread (A – D)	2.93**	3.68	3.59**	4.58
Panel F: Fung and Hsieh (2004) model augmented with out-of-the-money call and put option factors									
Portfolio A (1st funds)	7.99**	5.75	5.14**	6.40					
Portfolio B (2nd to 5th fund launched)	6.35**	4.31	3.33**	3.31					
Portfolio C (6th to 10th fund launched)	5.94**	3.61	2.77*	2.28					
Portfolio D (11th to 20th fund launched)	5.20**	2.91	1.53	1.06					
Spread (A – D)	2.79**	3.41	3.61**	4.16					

Notes. Every month, hedge funds are sorted based on their launch date within each hedge fund firm. Alpha is estimated relative to the Fung and Hsieh (2004) seven-factor model. The Fung and Hsieh (2004) factors are the Standard & Poor's (S&P) 500 return minus risk free rate (*SNPMRF*), Wilshire small cap minus large cap return (*SCMLC*), change in the constant maturity yield of the U.S. 10-year Treasury bond adjusted for the duration of the 10-year bond (*BD10RET*), change in the spread of Moody's BAA bond over 10-year Treasury bond appropriately adjusted for duration (*BAAMTSY*), bond PTFS (*PTFSBD*), currency PTFS (*PTFSFX*), and commodities PTFS (*PTFSCOM*), where PTFS is primitive trend following strategy. Panel A reports results adjusted for backfill bias by removing the return observations before fund listing date. Panel B reports results after unsmoothing returns using the Getmansky et al. (2004) algorithm. Panel C reports results after adding back fees to form prefee returns. Panel D reports results adjusted for dynamic risk exposures by using a rolling 36-month window to calculate factor loadings. Panel E reports results after augmenting the Fung and Hsieh (2004) model with the MSCI Emerging Market Index excess return. Panel F reports results after augmenting the Fung and Hsieh (2004) model with the Agarwal and Naik (2004) out-of-the-money call and put option factors. Panel G reports results after augmenting the Fung and Hsieh (2004) model with the Pástor and Stambaugh (2003) liquidity factor. Panel H adjusts for fund termination by assuming that a fund delivers a –10% return for the month after it stops reporting returns. Panels I and J report results for two subsample periods: January 1994 to December 2003 and January 2004 to December 2013, respectively. Panel K reports results after including duplicate share classes in the fund sample. The *t*-statistics are derived from White (1980) standard errors. The sample period is from January 1994 to December 2013.

*Significant at the 5% level; **significant at the 1% level.

et al. (2015) of venture capital supply at founding to instrument for firm listing status. Firm strategy flow at founding is the strategy flow of the first fund conceived by the firm in the one-year period prior to firm inception.[23] We argue that the ability to attract capital at inception allows a first fund to grow quickly and sets the stage for the launch of follow-on funds later. The first-stage results in column (1) of Table A.3 in the online appendix confirm this prediction. The supply of capital around the time of firm founding is a negative and significant predictor of a firm's single-product status, proxied by *FIRST*, with an *F*-statistic of 20.52.[24]

In columns (2) and (3) of Table A.3, we report the second stage results for the fund return and alpha equations, respectively. After instrumenting for first fund status or *FIRST* with firm strategy flow at inception, first funds continue to outperform follow-on funds. The results reported in columns (4)–(6) of Table A.3 indicate that the fund launch chronology results are also robust to adjusting for endogeneity.

4. Robustness Tests

In this section, we present a medley of robustness tests to ascertain the strength of our empirical results.

4.1. Backfill Bias

First funds may backfill their returns more than do follow-on funds. In response to such concerns, we confine the analysis to TASS and HFR funds for which we have the date that the fund listed on the databases (only available in TASS and HFR). Next, we redo the baseline Table 4 portfolio sort for those returns at or after the respective fund listing date. As shown in panel A of Table 11, our results are robust to controlling for backfill bias in this fashion. Inferences also remain unchanged when, as an alternative, we remove the first 24 months of returns for all funds to adjust for backfill and incubation bias.

4.2. Serial Correlation

Serial correlation in fund returns could arise from linear interpolation of prices for infrequently traded securities, the use of smoothed broker dealer quotes, or deliberate performance-smoothing behavior. This could inflate some of the test statistics that we use to make inferences. To allay such concerns, we unsmooth fund returns using the algorithm of Getmansky et al. (2004) and redo the Table 4 portfolio sort. The results reported in panel B of Table 11 indicate that the findings are not driven by serial correlation. We also redo the Table 5 regressions with fund returns adjusted for serial correlation. The coefficient estimates reported in panel A of Table A.4 in the online appendix indicate that the findings are also not by-products of serial correlation.

4.3. Prefee Returns

Hedge fund returns are reported net of fees. If first funds charge lower fees than do follow-on funds, this may explain the outperformance of the former. To check, we back out prefee fund returns. As shown in panel C of Table 11, the baseline portfolio sort spreads are even greater when we analyze prefee fund returns.

4.4. Dynamic Risk Exposures

One concern is that the beta loadings of the fund portfolios might not stay constant over time. As a result, the risk-adjustment for the baseline portfolio sort might not be accurate. To account for dynamic factor loadings, we calculate the factor loadings using a rolling 36-month window and use those factor loadings to calculate abnormal returns one month forward. The results, presented in panel D of Table 11, indicate that our findings are robust to catering for dynamic risk exposures.

4.5. Additional Risk Factors

Relative to follow-on funds, first funds could be loading up more on some omitted risk factor that did well over the sample period. Hence, we augment the Fung and Hsieh (2004) model with (i) an emerging markets factor derived from the MSCI Emerging Markets Index return, (ii) the out-of-the-money (henceforth OTM) S&P 500 call and put option-based factors from the Agarwal and Naik (2004) model, and (iii) the Pástor and Stambaugh (2003) liquidity factor, and redo the Table 4 portfolio sort. The results presented in panels E–G of Table 11 indicate that our baseline findings are not driven by the presence of omitted risk factors.[25]

4.6. Fund Termination

There are concerns that, because funds that drop out from the database could have terminated their operations, the portfolio alphas are biased upward. Edelman et al. (2013) find that returns of funds after they dropped out of the databases do not differ materially from returns of funds that remain in the databases. Nonetheless, to allay such concerns, we assume that, for the month after a fund drops out of the database, its return is –10%. Thereafter, money is reallocated to the remaining funds in the portfolio. As shown in panel H of Table 11, the results are robust to this adjustment. We also experiment with more extreme termination returns of –20% and –30% and obtain qualitatively similar results.

4.7. Subsample Analysis

To understand how the outperformance of first funds varies over time, we split the sample period into two subperiods: January 1994 to December 2003 and January 2004 to December 2013. Next, we redo the Table 4 portfolio sort for each subperiod. The results in panels I

and J of Table 11 indicate that our findings are stronger in the first subperiod than in the second subperiod. Nonetheless, the alpha of the spread between portfolios A and D is still economically and statistically significant for the second subperiod.

4.8. Duplicate Share Classes

In our analysis, we exclude duplicate share classes. One concern is that including duplicate share classes may materially affect the results. To test, we redo the baseline portfolio sort and fund performance regressions after including duplicate share classes. The results reported in panel K of Table 11 and panel B of Table A.4 in the online appendix indicate that the findings are qualitatively unchanged when we include duplicate share classes.

4.9. Firm Fixed Effects

The results from the regressions on fund performance in Table 5 may be driven by performance differences between funds in single-product firms and follow-on funds in multiple-product firms, and between first and follow-on funds in multiple-product firms. To ascertain that they are not driven purely by the former, we include firm fixed effects and redo the baseline regressions. The results presented in panel C of Table A.4 in the online appendix suggest that the findings in Table 5 are at least partly driven by performance differences between first and follow-on funds from multiple-product firms.

4.10. Firm Size

Firm size may drive the underperformance of follow-on funds. To test, we include the logarithm of last month's firm AUM as an additional independent variable and re-estimate the baseline fund performance regressions. The results, reported in panel D of Table A.4 in the online appendix, are largely robust to controlling for firm size.

5. Conclusion

The empirical results in this paper enrich our understanding of capital accumulation in the hedge fund industry. We show that there exist spillover effects from first to follow-on funds launched by hedge fund firms. Stellar first fund performance allows hedge fund firms to raise follow-on funds that charge higher fees, set more onerous redemption terms, and attract more capital. The spillover effects in turn lead hedge fund firms to focus more on the performance of their first funds. Consequently, first funds outperform follow-on funds after adjusting for risk. In line with an agency explanation, the performance spread between first and follow-on funds is strongest for funds with poor incentive alignment, that is, funds that charge low performance fees relative to management fees, feature no manager coinvestment, operate far below their high water marks, and attract flows that are insensitive to performance. Also consistent with the agency view, the strategy of leveraging on successful first fund performance to launch multiple follow-on funds hurts investors but benefits fund managers. Multiple-product firms underperform single-product firms while harvesting greater fee revenues. Investors respond to this growth strategy by redeeming from first funds when follow-on funds underperform. Therefore, firms cannot completely forsake quality when embarking on a multiple-product growth strategy that emphasizes quantity. Ironically, although growing the hedge fund franchise by launching multiple products hurts performance ex-post, the prospect of generating substantial fee revenues through a multiple-product hedge fund firm may well incentivize outperformance ex-ante. Nevertheless, the findings in this paper suggest that judicious investors should focus on the first funds launched by hedge fund firms when allocating capital and eschew firms that launch multiple follow-on funds.[26]

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Endnotes

[1] See Pozen and Clay (2012, p. 6).

[2] See https://www.barclayhedge.com/research/indices/ghs/mum/HF_Money_Under_Management.html, accessed November 8, 2019.

[3] See "Hedge funds must grapple with shifting balance of power," Financial Times, August 25, 2015, for a discussion on the institutionalization of the hedge fund industry.

[4] According to Troy Gayeski, partner at SkyBridge, a New York-based fund of funds, "Ten years ago a hedge fund with $50m of assets could generate plenty of revenue to cover overheads. These days it has to be $500m, and part of the reason is that regulatory requirements have gone up dramatically." See "Hedge funds move to family offices is not entirely popular," *Financial Times*, October 23, 2015. For a discussion on fees see "Hedge funds cut fees to stem client exodus," Financial Times, December 18, 2015, and "Calpers to pare external managers," *Wall Street Journal*, June 8, 2015.

[5] For example, the *Financial Times* reported that Man Group's stock rose buoyed by the outperformance of its first fund, AHL. See "Man Group outperforms as first fund sparkles," *Financial Times*,

September 24, 2011. Similarly, the *Wall Street Journal* reported that BlueCrest plans to stop managing money for outside clients after a run of poor returns and client redemptions from its first fund, BlueCrest Capital International. See "BlueCrest capital decides to go private," *Wall Street Journal*, December 2, 2015.

[6] In the paper, we principally label as multiple-product firms, those with multiple funds. That said, our results prevail when we define as multiple-product firms, those with multiple distinct strategies. Specifically, firms with uncorrelated strategies underperform those with one strategy (or correlated strategies), but harvest greater fee revenues.

[7] Unlike Aggarwal and Jorion (2010), who analyze the impact of time since fund launch on performance, we investigate the association between the launch order of funds within firms and performance.

[8] Jorion and Schwarz (2014) argue that the discontinuity at zero in the hedge fund net return distribution documented by Bollen and Pool (2009) is not evidence of manager manipulation.

[9] The results are robust to using pre-fee returns.

[10] If a hedge fund firm has an onshore and offshore fund pair, we drop the offshore fund, essentially treating it like a duplicate share class. We also find that our baseline results do not change if we drop the onshore fund in those cases. Our findings are therefore not driven by differences between the onshore and offshore duplicate of the same fund (Aragon et al. 2014).

[11] Of the 6,882 firms in our sample, 6,387 have a single first component fund, while only 495 have multiple first component funds. In other words, 93% of the firms in our sample started with only one fund. The average number of first component funds per firm is 1.087. In lieu of forming composite first funds, we cater for the possibility that firms may launch more than one fund in their first month in two alternative ways. First, we drop firms that have more than one first fund, that is, firms that launched more than one fund during their first month. Second, for such firms, we consider the largest fund launched during the first month as the first fund (based on fund AUM for the launch month) and remove the other smaller fund or funds conceived during that month. Our baseline results remain qualitatively unchanged with these adjustments.

[12] The trend following factors can be downloaded from http://faculty.fuqua.duke.edu/%7Edah7/DataLibrary/TF-Fac.xls.

[13] The results remain qualitatively unchanged when alpha is estimated for all funds with at least 36 months of return data.

[14] In results available upon request, we also find that first fund performance is positively associated to the total number of follow-on funds conceived several years later. For example, when we sort firms into quintiles based on first fund returns averaged over the first three years postinception, we find that the cumulative number of follow-on funds launched up to five years later for firms in the highest performance quintile is significantly greater than that for firms in the lowest performance quintile.

[15] Inferences do not change when we estimate regressions on raw fund returns instead of alphas. Note that we windsorize fund returns and flows at the 0.5 and 99.5 percentiles to ameliorate the effects of outliers.

[16] Our management fee results are broadly consistent with those of Ramadorai and Streatfield (2012). While we find that successful first funds do not allow follow-on funds to charge higher management fees, we also find that superior follow-on funds allow subsequent follow-on funds to charge higher management fees. Therefore, like Ramadorai and Streatfield (2012), we do find that superior firm performance precedes higher management fees. In unreported results, by estimating regressions on follow-on fund management fee with past firm performance as the independent variable, we verify that this is indeed the case.

[17] In results available upon request, we find no evidence of spillover effects on the fees, notice periods, and flows of the subsequent funds, when we analyze the third funds, that is, the second follow-on funds, launched by hedge fund firms.

[18] We also estimate the same set of regressions as in Table 5 but with both *FIRST* and *CHRONO* as independent variables, together with the same set of controls. The results are largely robust to the inclusion of both independent variables in the regression. The coefficient estimates on *FIRST* are positive and statistically significant at the 1% level across all regression specifications. Those on *CHRONO* are all negative and statistically significant at the 1% level, save for that in the Fama-MacBeth regression on fund returns, in which it is negative and statistically significant at the 10% level. These results are available upon request and suggest that successive fund performance continues to deteriorate even after the launch of the first follow-on fund.

[19] The Fama-MacBeth regressions for the subsets of funds with and without personal capital reported in Table 6 do not feature strategy fixed effects as, within each group, there exist months for which there are no funds in some strategies.

[20] Inferences do not change when we exclude *FIRST* as an independent variable in the Table 7 regressions.

[21] We obtain similar inferences when we sort based on the average pairwise correlation of the strategies of the funds managed by the firm.

[22] The results reported in panel L of Table 9 suggest that first funds in group IV are able to grow their fee revenues more than do first funds in group III. Specifically, based on the fees reported in the first row of the above-mentioned panel, first funds in the different strategy group (i.e., group IV) grow their fee revenues by US$ (10.09 – 8.22 – (6.20 – 5.35)) million or US$1.02 million per annum ($t$-statistic = 7.16) more than do first funds in the identical strategy group (i.e., group III). We also conduct the analogous analysis for firm fee revenues as opposed to first fund fee revenues. We find that firms in the different strategy group grow their fee revenues by US$0.83 million per annum ($t$-statistic = 2.20) more than do firms in the identical strategy group.

[23] Specifically, Asker et al. (2015) use as their instrument the total number of firms receiving first-round venture capital funding in a firm's headquarter state two years after a firm was funded. We use firm strategy flow in the one-year period *before* firm inception as an instrument since we seek to explain fund launch chronology status for all periods after firm inception. We obtain similar inferences when we use firm strategy flow during the two-year period before inception.

[24] For single-fund firms, *FIRST* is always equal to one. For multiple-fund firms, the probability that *FIRST* equals one in any month is a decreasing function of the number of follow-on funds launched by the firm that report returns that month.

[25] Inferences do not change when we augment the Fung and Hsieh model with the emerging markets factor, the out-of-the-money call and put option-based factors, and the Pástor and Stambaugh (2003) liquidity factor, and use the resultant 11-factor model to adjust for risk exposure in our portfolio sorts.

[26] Whether a firm is single- or multiple-product is determined at each point in time. Therefore, the challenge for investors who subscribe to funds managed by single-product firms is that they may not remain single-product once they deliver superior investment performance.

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