A Internet Appendix

To fix ideas, we outline a simple, rational, two-period partial equilibrium model that highlights how the internal capital allocation decisions of hedge fund managers interact with measured performance. We model active portfolio managers who are maximizing their profits by selectively allocating insider capital between a family of funds under their control. Insiders rationally allocate internal capital across strategies to maximize total profits.

Our simple model has several salient features that differ from previous work. First, we disaggregate capital into insiders and outsiders. This step captures the idea that an insider's earnings are tied to both management fees earned on outside capital and returns on insider capital. We also model endogenous fund generation in the form of multiple investment strategies and managerial discretion to differentially allocate insider capital across these strategies. For clarity, in both notation and results, we focus on a two-period model. Finally, costs in our model are convex in *gross returns*, as in Berk and van Binsbergen (2017), as this helps match stylized facts we observe in the data.

A.1 Capital: Insider and Outsider

There are two types of investors in our model: insiders and outsiders.

An *insider* is an investor with highly specialized arbitrage skills.[23] This maps in practice to someone who has access to a positive alpha strategy (i.e., portfolio managers, hedge fund employees, and closely related parties). An investor can invest in their strategy, in the appropriate passive benchmark portfolio, or a combination of both.

An *outsider* refers to anyone who is not an insider. They can be thought of as limited partners who delegate their capital to a manager through a fund. By definition, outsiders

[23] We take a similar view to Shleifer and Vishny (1997) that arbitrage is typically carried out by a few, highly specialized investors.

do not possess specialized skills. As such, outsiders can invest their capital in the appropriate passive benchmark portfolio, delegate their capital to these insiders to access investment strategies, or a combination of both. We assume full competition among outside investors.

Capital is denoted by q and any superscript notation indicates who supplies the capital. Total capital, insider capital, and outsider capital are denoted by q^T, q^I and q^O, respectively. Total capital is defined as:

$$q^T \equiv q^I + q^O \tag{12}$$

We exclude the possibility of leverage and define total capital (q^T) as the sum of inside (q^I) and outside capital (q^O). Further, we exclude the possibility of short-selling, so $q^I, q^O \geq 0$.[24]

A.2 *Investment Technology*

An active manager specializes in N strategies indexed by n. Each strategy has limited investible capacity. More capital invested in a strategy at time t, either from an insider or an outsider, results in a lower gross excess return. Formally, we define the gross return to strategy n at time $t+1$, for an investment of $q_{n,t}$, by:

$$R_{n,t+1} = \alpha_n - C_n\left(q^T_{n,t}\right) \tag{13}$$

The excess return is above an appropriate passive benchmark to which all investors are assumed to have access. The first term, α_n, captures the maximum alpha to strategy n and is by assumption positive ($\alpha_n > 0$). The second term is a cost function, $C_n\left(q^T_{n,t}\right)$, which depends on the *total* capital invested at period t in strategy n. The cost function is strictly non-negative ($C \geq 0$), increasing, convex ($C' > 0$, and $C'' > 0$). Further, at no investment, $C(0) = 0$, and in the limit, $\lim_{q^T_t \to \infty} C'(q^T_{n,t}) = \infty$.[25] The assumption of decreasing returns to scale is motivated by research suggesting a negative relationship between size and performance, such as Fung, Hsieh, Naik, and Ramadorai (2008).

[24] Including leverage subject to a collateral constraint does not affect our model results.

[25] This results in a decreasing returns to scale in the gross excess return and a departure from Berk and van Binsbergen (2017), where costs are linear in the return equation.

It is important to emphasize that different strategies have different α_n and cost functions C_n. For model simplicity and to make our analysis concrete, we assume a specific functional form for this cost: $C_n\left(q_{n,t}^T\right) = \frac{b_n}{2}\left(q_{n,t}^T\right)^2$ (we relax this assumption in an alternative model assumption). The scale cost is non-negative, $b_n \geq 0$, and captures how well the strategy scales.[26] A smaller scale cost indicates that a strategy scales better. An example of the trade-off between strategies with different excess return and scale is shown in Figure A.1. Our analysis assumes that capacity constraints operate at the level of each fund. Capacity constraints may also operate at larger levels (i.e., convertible bond arbitrage may be a less successful strategy when more funds operate using that strategy); to account for this possibility in our empirical analysis, we control for strategy type. Further, we carry out additional robustness analysis controlling for strategy by year, which also leaves our results unchanged.

To simplify notation, we assume that capital is allocated at time t and accordingly suppress time subscripts on all capital variables q. All returns are assumed to occur at $t+1$, and time subscripts are omitted for returns as well. For exposition and clarity, we abstract from time dynamics beyond the two-period model and risk preferences in this deterministic setup.

A.3 Baseline Model: One Strategy

We focus first on the case in which firms have only one strategy, $N = 1$, and omit the subscript indexing of strategies. We identify the total dollar payoff to managers. The total dollar payoff, V^I, is defined as the profit from investing in their own strategy in addition to fees collected on managed outsider capital.

We assume that the management fee, f, is a fraction of outside capital invested, taking these as given. More realistically, hedge fund fees also incorporate a performance fee on returns above a certain hurdle rate, assuming the fund's value exceeds a high water mark,

[26] Costs are orthogonal to risk factors and collinear with α_n.

as well as exit fees. We incorporate performance fees in the additional analysis below. Outsider dollar payoff is similar to the insider dollar payoff but subtracts the fees:

$$V^I = q^I \left(R\left(q^T\right)\right) + q^O f \tag{14}$$

$$V^O = q^O \left(R\left(q^T\right)\right) - q^O f \tag{15}$$

A.3.1 Case 1: Unconstrained Inside Capital

We first consider the case where insider capital is unconstrained. How much would an insider invest in their own fund? Absent outside investors, the insiders' objective can be written as:

$$\arg\max_{q^I} \quad V^I = q^I \left(\alpha - C\left(q^I\right)\right)$$

With a solution:

$$\bar{q}^{I*} = \sqrt{\frac{2\alpha}{3b}}. \tag{16}$$

Notice that if $\bar{q}^{I*} = q^T$, insiders are sufficiently capitalized and refuse outside capital. Performing a substition back into equation 14, which represents the total dollar payoff to insiders, we obtain $\frac{2\alpha q^I}{3}$, which corresponds to the maximum achievable investor returns from the strategy.

A.3.2 Case 2: Fully Constrained Inside Capital

Next, we consider the case where insider capital is fully constrained, and are unable to pledge any of their capital to a strategy. How much outsider capital would they accept? Outsiders will continue to invest until the benefit from investing in the strategy is equal to zero. The maximum q^O is given by:

$$\bar{q}_t^{O*} = \sqrt{\frac{2\left(\alpha - f\right)}{b}}. \tag{17}$$

Notice that the total dollar payoff to outsiders is driven to zero (as the result of our assumption of full competition among outside investors). Further, the insider only earns management fees.

A.3.3 Case 3: Constrained Inside Capital

We next consider the interior case where an insider has only one investment strategy but it is capital-constrained. That is, $q_t^I \in \left[0, \bar{q}_t^{I*}\right)$. How much outside capital should the insider accept? The insiders choose the amount of outside capital to maximize the objective, subject to the outsider capital providers' participation constraint. These conditions are given by:

$$\underset{q^O}{\arg\max} \qquad q^I\left(\alpha - C\left(q^T\right)\right) + fq^O \tag{18}$$

$$\text{subject to } V^O \equiv q^O\left(\alpha - C(q^T)\right) - fq^O \geq 0 \tag{19}$$

When $q^O > 0$, and the insider collects a proportional and fixed management fee, f, for their services. The model is solved by:

$$q^{O^*} = \begin{cases} \sqrt{\frac{2(\alpha - f)}{b}} - q^I & if\ \alpha - f < \frac{f^2}{2b(q^I)^2} \\ \frac{f}{bq^I} - q^I & if\ \left(\frac{f}{bq^I} - q^I\right)\left(\alpha - f - \frac{f^2}{2b(q^I)^2}\right) > 0 \\ 0 & else\ \sqrt{\frac{f}{b}} < q^I \end{cases}$$

The first region is the case where both insiders and outsiders allocate to the strategy. Insiders are highly capital constrained, and outsiders can allocate capital up to the point where their participation constraint is binding. As a result, the total dollar payoff to outsiders is equal to zero. In this region, insiders can increase their capital level, which would directly replace the level of outsider capital.

The second region is the case where an insider can maximize their own total dollar payoff by limiting the level of outsider capital. Outsiders would prefer to contribute more capital, but this action would not maximize the total dollar payoff to insiders. As a result, the remaining outside investors earn a positive total dollar payoff from investing in the strategy.

The final region is the case where the outsider's participation constraint is binding. The insider has reduced the gross return of the strategy to the point where the marginal benefit to an additional dollar from an outsider is less than the marginal cost of fees and the capacity constraint. As a result, no outsider would contribute to this strategy. Notice that insiders may continue to contribute to this strategy, as they do not pay fees.

Proposition 1 *For a non-binding management fee and positive level of outside investment, total capital decreases as a portion of insider capital.*

Proof Consider an investment strategy managed by an insider with a non-binding fee, $0 < f < \frac{2}{3}\alpha$, and a positive level of outside investment, $q^O > 0$. Outsider capital q^T decreases in the level of insider investment. This result can be seen directly:

$$\frac{dq^{O^*}}{dq^I} = \begin{cases} -1 & if \ \alpha - f < \frac{f^2}{2b(q^I)^2} \\ -\frac{f}{bq^{I2}} - 1 & if \ \left(\frac{f}{bq^I} - q^I\right)\left(\alpha - f - \frac{f^2}{2b(q^I)^2}\right) > 0 \end{cases}$$

Proposition 2 *Gross returns increase in inside investment for non-binding management fees and positive levels of outside investment.*

Proof The fact that gross returns decrease in scale follows immediately from our assumption of convex costs. In conjunction with the previous proposition, this finding implies that returns increase in inside capital in the region with non-binding management fees and a positive level of outside investment.

Proposition 3 *Total dollar payoff to insiders increases as a fraction of insider investment*

Proof Plugging the optimal level of outsider capital q^{O^*} into the total dollar payoff to insiders, we have:

$$V^I = \begin{cases} f\sqrt{\frac{2(\alpha - f)}{b}} & if\ \alpha - f < \frac{f^2}{2b(q^I)^2} \\ (\alpha - f)\, q^I - \frac{f^2}{2bq^{I2}} + f\sqrt{\frac{2(\alpha - f)}{b}} & if\ \left(\frac{f}{bq^I} - q^I\right)\left(\alpha - f - \frac{f^2}{2b(q^I)^2}\right) > 0 \\ q^I\left(\alpha - \frac{b}{2}q^{I^2}\right) & else\ \sqrt{\frac{f}{b}} < \bar{q}_t^{I*} \end{cases}$$

Taking the derivative of the total dollar payoff to insiders with respect to insider capital, we obtain:

$$\frac{dV^I}{dq^I} = \begin{cases} 0 & if\ \alpha - f < \frac{f^2}{2a(q^I)^2} \\ (\alpha - f) + \frac{f^2}{aq^{I^3}} & if\ \left(\frac{f}{aq^I} - q^I\right)\left(\alpha - f - \frac{f^2}{2a(q^I)^2}\right) > 0 \\ \alpha - \frac{3a}{2}q^{I^2} & else\ \sqrt{\frac{f}{a}} < \bar{q}_t^{I*} \end{cases}$$

A.4 *Extension: Alternative Fee Specifications*

A.4.1 Performance Fees

In this section, we consider the more realistic situation in which managers charge both management and performance fees on excess returns. In this case, funds levy both a proportional management fee f as well as a percentage g of performance fees on additional excess returns. The manager's problem in this case reduces to:

$$\arg\max_{q^O} \quad \left(q^I + gq^O\right)\left(\alpha - \frac{b}{2}\left(q^T\right)\right) + fq^O \tag{20}$$

$$\text{subject to } V^O \equiv (1-g)\, q^O\left(\alpha - \frac{b}{2}(q^T)\right) - fq^O \geq 0 \tag{21}$$

The key result of our model—that returns increase in inside capital—persists in this alternative specification.

Proposition 4 *For non-binding fees and a positive level of outside investment, gross returns increase in the percent of insider capital*

Proof We focus on the interesting case in which inside capital is scarce but non-zero, so that funds contain a mix of both inside and outside capital. In this case, funds take fees as given and choose the level of outside capital to enter the fund. The solution to the optimal outsider capital is given by:

$$q^O = \frac{2q^I\left(b+2bg\right)+2\sqrt{{q^I}^2\left(b+2bg\right)^2+6bg\left(g\alpha+f-{q^I}^2\left(\frac{2b+bg}{2}\right)\right)}}{3bg}.$$

The key relation defining how returns change with the proportion of inside capital is determined by:

$$\left(\frac{dq^O}{dq^I}\right) = -\frac{\left(b+2bg\right)q^O+\left(2b+bg\right)q^I}{\left(3bg\right)q^O+\left(b+2bg\right)q^I} < -1.$$

In other words, the introduction of an additional dollar of inside capital displaces more than a dollar of outside capital in equilibrium. The intuition behind this result is that when more of their personal capital is at stake, managers internalize the dilutive effects of fundraising on total strategy profits when their own capital is at stake. Given our assumption of quadratic costs, this displacement of capital ensures that fund returns are higher with additional insider investment. Even though performance fees better align the incentives between managers and investors, and hence result in managers not scaling up the size of the fund as much as when they charge only management fees, these fees are not as effective as personal capital contributions (from which insiders gain all of the additional performance benefits).

A.4.2 Linear Cost

In this section, we revert to only considering management fees, but we consider a cost function which is linear (rather than quadratic) in total capital:

$$\arg\max_{q^O} \quad q^I\left(\alpha - \frac{b}{2}\left(q^O + q^I\right)\right) + f q^O \tag{22}$$

$$\text{subject to } V^O = q^O\left(\alpha - \frac{b}{2}\left(q^O + q^I\right)\right) - f q^O \geq 0. \tag{23}$$

Proposition 5 *For non-binding fees and a positive level of outside investment, gross returns increase in the percent of insider capital with linear costs*

Proof Optimal outsider capital is given by:

$$q^{O^*} = \frac{2\alpha}{b} - 2q^I \tag{24}$$

Which immediately yields $\frac{dq^O}{dq^I} < -1$ and so returns increasing in inside capital.

Finally, an important assumption in our model is that managers and investors take fees (either performance or managerial) as given. To justify this assumption, we document in our empirical results that fees tend to be sticky, exhibiting little cross-sectional or time-series variation, and not strongly varying across inside investment. These facts suggest a strong degree of stickiness in price setting which we approximate through fixed fees. In principle, funds could also adjust fees as well as quantities of outside capital they allow into their funds. If funds are able to do so in a fully flexible manner, they will set fees to equal gross returns, so capturing all value-generation from the fund. As long as managers are not able to fully extract fee income from investors, our key results regarding the relationship between inside investment and returns will hold.

A.5 *Extension: Two Strategies*

Until now, we have considered the case of one strategy. We extend the analysis to an insider who has access to two strategies, $N = 2$. Consider the insider with access to the following returns:

$$R_1 = \alpha_1 - C_1\left(q_1^T\right)$$
$$R_2 = \alpha_2 - C_2\left(q_2^T\right).$$

Without loss of generality, assume that $\alpha_1 > \alpha_2$. The interesting case arises when $b_1 < b_2$. This configuration means that strategy one has a higher alpha, and also a lower higher scale cost, as compared to strategy two.

Capital between the two strategies and investors is given by $q_n^T = q_n^I + q_n^O$ with $n \in \{1, 2\}$. For insiders $q^I = q_1^I + q_2^I$, for outsiders $q^O = q_1^O + q_2^O$, and in aggregate $q^T = q_1^T + q_2^T$. Shorting an insider's management service is ruled out, so $q_n^I \geq 0$ and $q_n^O \geq 0$.

A.5.1 Case 1: Constrained Inside Capital, One Fund

The insider's total dollar payoff is now the sum from each strategy, $V_1^I + V_2^I$. Given this result, how should an insider allocate their capital between strategies? If so, should the insider capital be allocated across strategies? Would an insider ever invest in the low alpha strategy? If so, what rule would govern this?

We first consider the case in which an insider capital is in the range of $0 < q^I < \sqrt{\frac{2\alpha_1}{3b_1}}$. Intuitively, an insider would invest in the high alpha strategy up to the point where the marginal total dollar add equals the low alpha strategy. Phrased differently, the insider would invest in strategy one for the initial range of q^I where:

$$\frac{dV_1^I}{dq_1^I} \geq \frac{dV_2^I}{dq_2^I}. \tag{25}$$

When the above inequality is satisfied, insiders maximize their dollar payoffs by allocating their capital to the high-alpha strategy—which means $q_1^I = q^I$ and $q_2^I = 0$ for the initial insider capital region. The dollar payoff for this partial regions is equal to V_1^I and is outlined in the previous section.

A.5.2 Case 2: Two Strategies, Sufficient Insider Capital, Two Funds

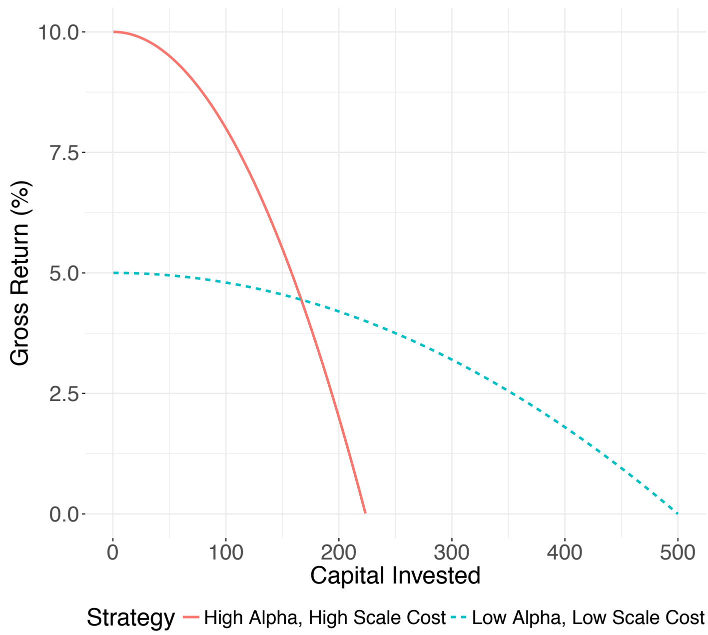
As an insider allocates capital towards strategy one, the marginal payoff of each additional dollar will decrease towards the marginal value of strategy two. That is, at some point, $\frac{dV_1^I}{dq_1^I} = \frac{dV_2^I}{dq_2^I}$ for some $0 < \hat{q}_1^I < \bar{q}_1^{I*}$. Once an insider's capital level reaches the threshold of $\hat{q}_1^I$, they will optimally mix between their two strategies to equate their marginal payoffs to insider capital.

An insider will continue to allocate to *both* strategies, equating the marginal dollar payoff from strategy one to the marginal payoff from strategy two. While we do not explicitly solve the optimal mixing scheme in this paper, we can see a sketch of this strategy in Figure A.2. An insider will continue to strategically allocate insider capital to both strategies for insider capital levels of:

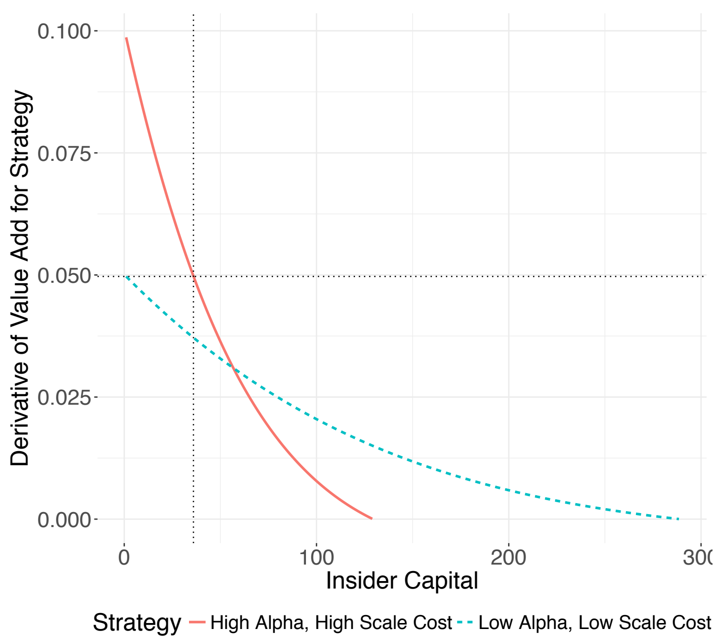
$$q_1^I \in \left[\hat{q}_1^I, \sqrt{\frac{2\alpha_1}{3b_1}} + \sqrt{\frac{2\alpha_2}{3b_2}}\right).$$

If funds raise outside capital, they do so to maximize dollar payoff in each fund subject to the fund-specific participation constraint.[27]

[27]We rule out the possibility that outside investors receive negative payoffs in some funds in order to participate in others.



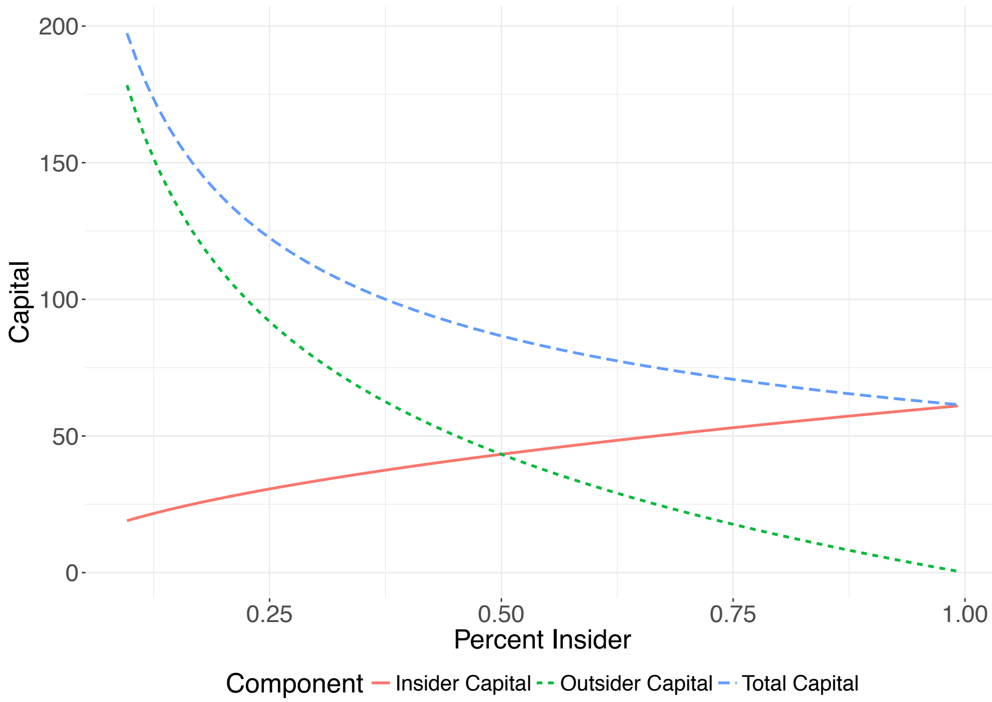
Panel A: Gross Return and Scale



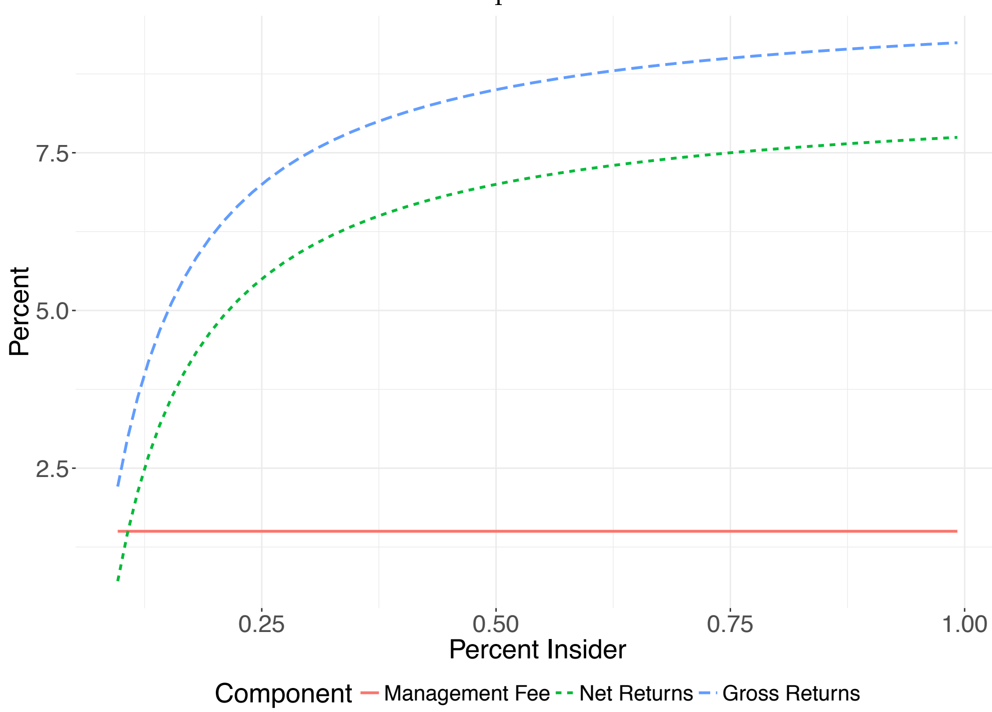
Panel B: Marginal Value-Added by Strategy and Capital

FIGURE A.1 **Return Profiles of Different Strategies**

The above figures shows two strategies. The horizontal axis is the total dollar invested q_t^T in a given strategy, while the vertical axis is $R_{n,t+1}$. The red line refers to a high alpha, high scale costs, while the blue dotted line refers to the low alpha, low scale cost strategy. The first strategy is parameterized by $\alpha = 10\%$, and $b = 4 \times 10^{-6}$, while the second is parameterized by $\alpha = 5\%$ and $b = 4 \times 10^{-7}$. The highest alpha, per strategy, is highest at a zero dollar investment. Panel A shows how gross returns vary across these two strategies as a function of total capital; Panel B shows how the derivative of fund value-added changes as a function of capital across both strategies.



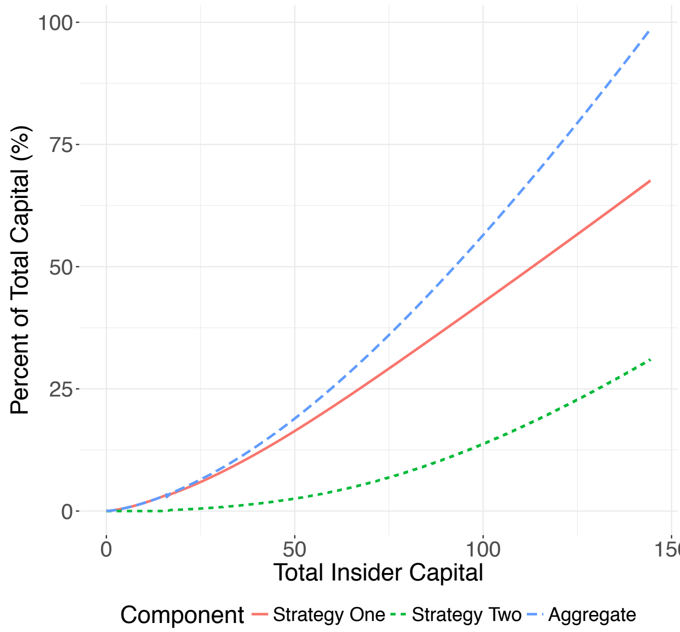
Panel A: Capital Sources



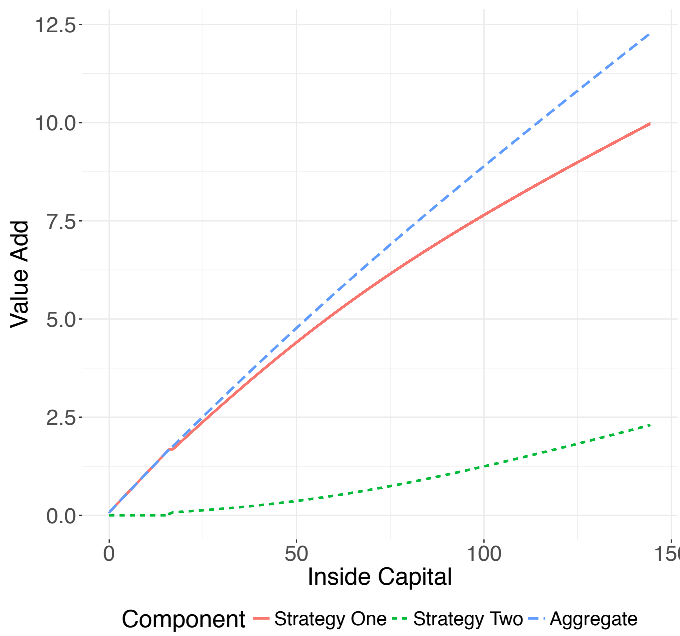
Panel B: Returns by Inside Investment

FIGURE A.2 **Capital and Payoffs**

This figure illustrates the distributions of fund size and returns by fraction of inside investment. Panel A illustrates that the total size of the fund decreases in the fraction of inside capital—the fund operates at a smaller capital capacity the more insiders are invested. Panel B shows that net returns to outsiders are higher with a greater proportion of inside investment. Parameters used in this example are $\alpha = 10\%$ and $b = 4 \times 10^{-6}$.



Panel A: Percent of Inside Capital Allocated Across Funds



Panel B: Payoffs Between Two Strategies

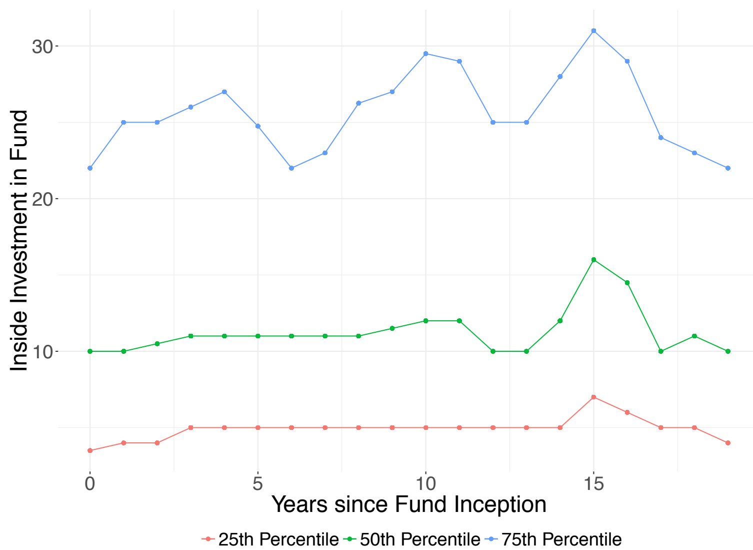
FIGURE A.3 **Percent Inside Allocation and Payoffs of Two Strategies**

This figure shows the optimal percent insider invested in each strategy across the total insider capital. Parameters for the high alpha strategy are $\alpha = 10\%$ and $b = 4 \times 10^{-8}$. Parameters for the low alpha strategy are $\alpha = 5\%$ and $b = 4 \times 10^{-7}$

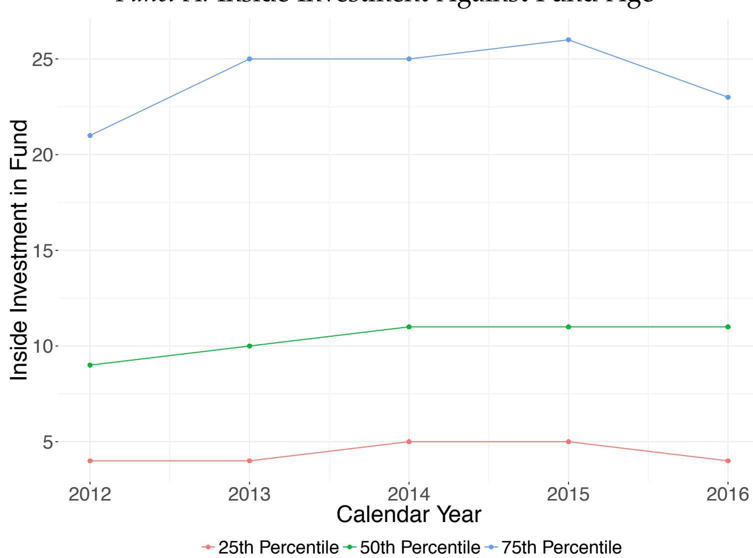
Important Notation

$R_{n,t+1}$	Gross excess return over the relevant benchmark portfolio, after accounting for scale effects of investing in strategy n.
α_n	Gross alpha for the first dollar invested in strategy n. This is the maximum gross excess return over the relevant benchmark, taken to be exogenous.
$r_{n,t+1}$	Net return from strategy n.
q_n^T	Total capital invested in strategy n. By definition, $q_n^T \equiv q_n^I + q_n^O$.
q_n^I	Insider capital invested in strategy n. This is taken to be exogenous.
q_n^O	Outsider capital invested in strategy n. This is taken to be exogenous.
$\bar{q}_n^{I*}$	The maximum amount of capital an insider choses to invest in a strategy if unconstrained.
V_n^I	Dollar payoff to insiders from strategy n. This equals the profit from returns and fees.
V^O	Dollar payoff to outsiders from strategy n. This equals the profit from returns minus fees.
$C_n\left(q^T\right)$	Scale factor of investment strategy. For concreteness, we use $C_n\left(q^T\right) = \frac{b_n}{2}\left(q_n^T\right)^2$ in this paper.
b_n	Scale factor of strategy that is associated with strategy n. This is taken to be exogenous.
f	Management fee as a fraction of the assets delegated by the outsider to the insider.
g	Performance fee as a fraction of the assets delegated by the outsider to the insider.
N	Total number of strategies available to an investor.
n	Refers to an individual strategy n. A strategy has a unique α_n, b_n, and thus $C_n\left(q_n^T\right)$.

B Additional Results



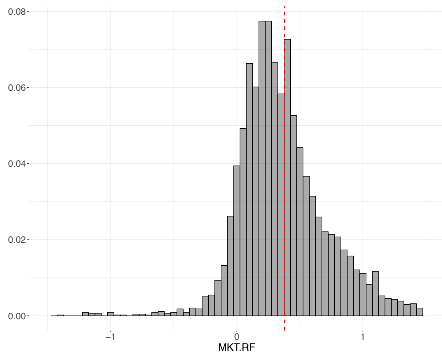
Panel A: Inside Investment Against Fund Age



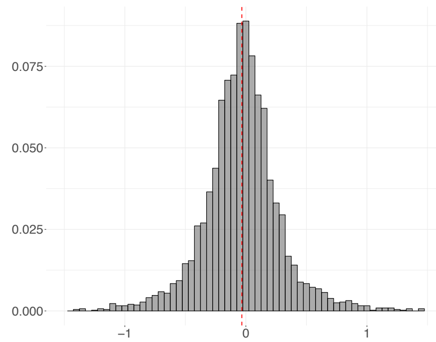
Panel B: Inside Investment Against Year

FIGURE B.1 **Evolution of Inside Investment**

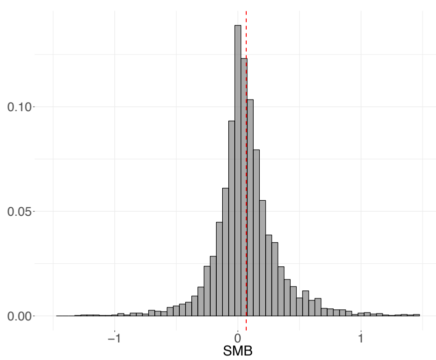
This figure highlights the evolution of inside investment. Panel A highlights the mean level of inside investment of a fund over its lifetime. The red, green, and blue graphs correspond to the 25th, 50th, and 75th percentile of inside investment, respectively. Panel B plots the same statistics over all funds aggregated by calendar year.



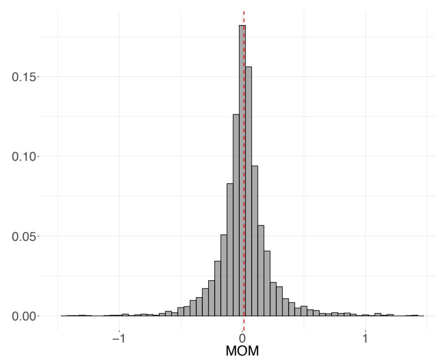
(a) Market Factor



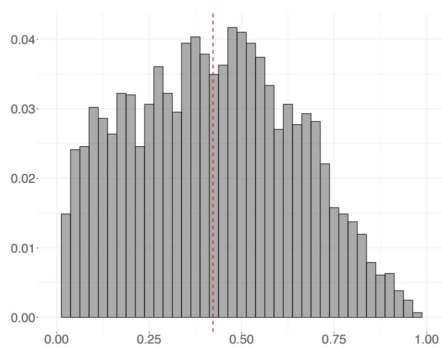
(b) Value Factor



(c) Small Factor



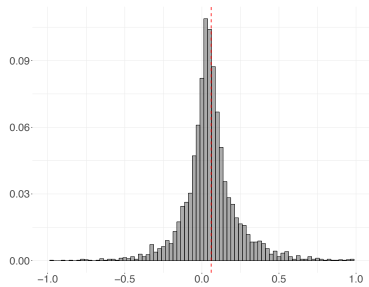
(d) Momentum Factor



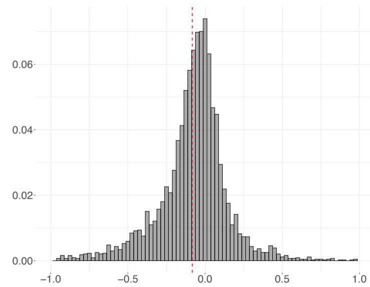
(e) R^2

FIGURE B.2 **Factor Distribution in Four-Factor Model**

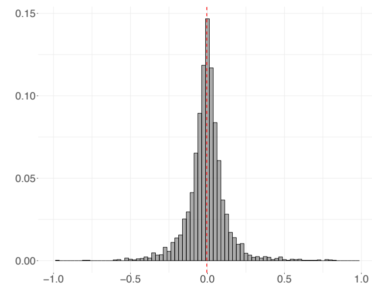
This figure plots the distribution of factor exposures in the Four-Factor (Fama-French and Carhart) model. The histograms plot the coefficient estimates from a time-series regression of factor exposures against hedge fund returns run for each fund, as well as the R^2 of each model fit.



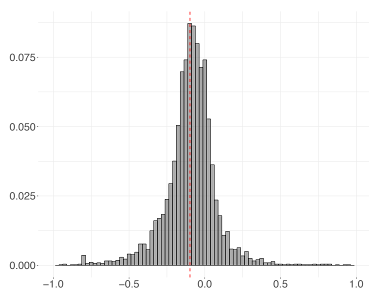
(a) Equity Market Factor



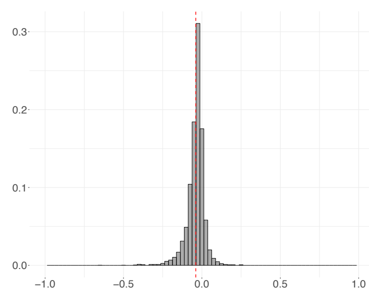
(b) Size-Spread Factor



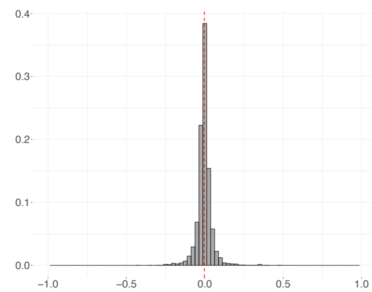
(c) Bond Market Factor



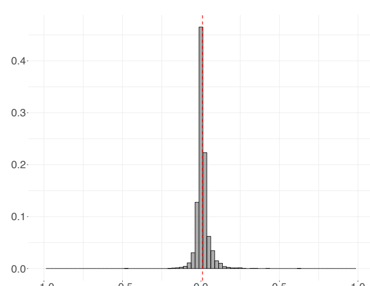
(d) Credit Spread Factor



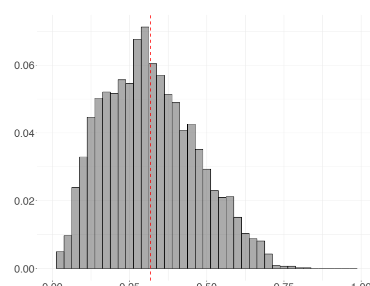
(e) Bond Trend Following Factor



(f) Currency Trend Following Factor



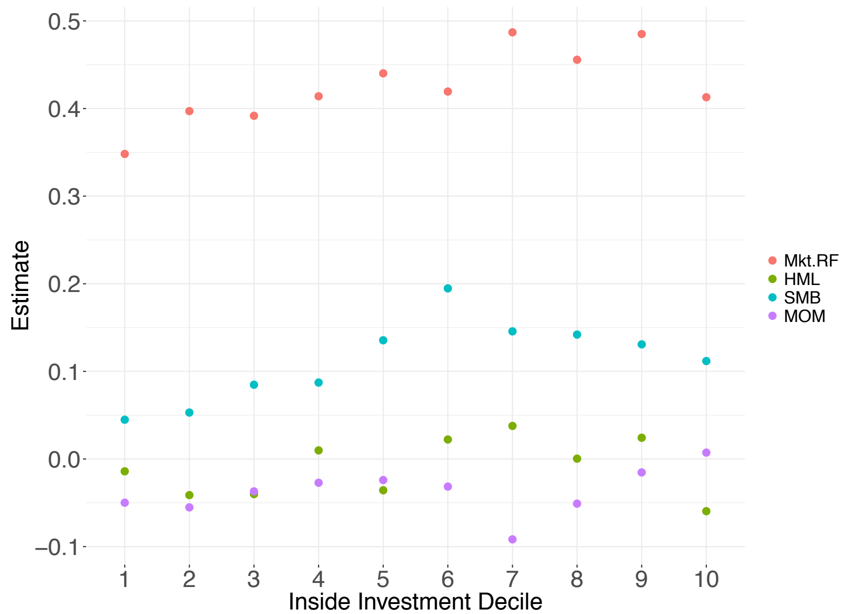
(g) Commodity Trend Following Factor



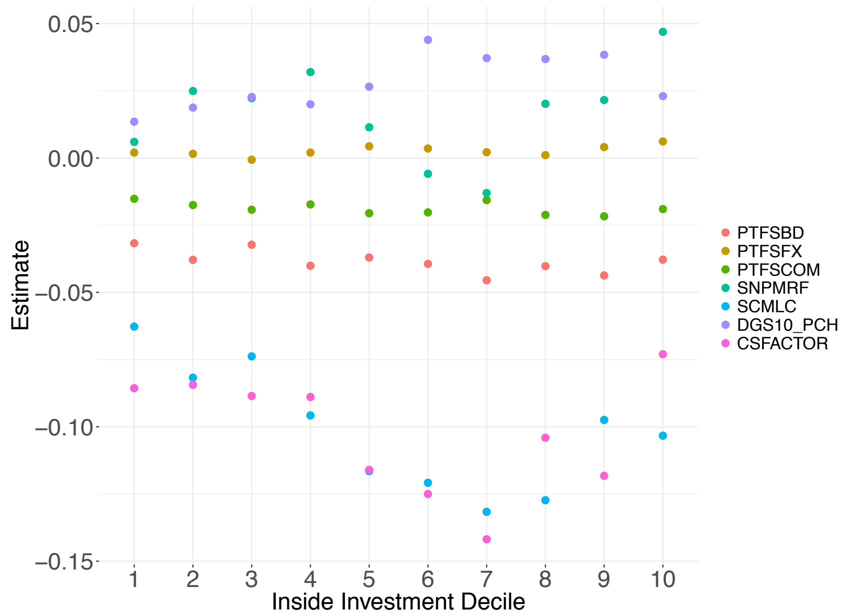
(h) R^2

FIGURE B.3 **Factor Distribution in Seven-Factor Model**

This figure plots the distribution of factor exposures in the 7-Factor Fung-Hsieh model. The histograms plot the coefficient estimates from a time-series regression of factor exposures against hedge fund returns run for each fund, as well as the R^2 of each model fit.



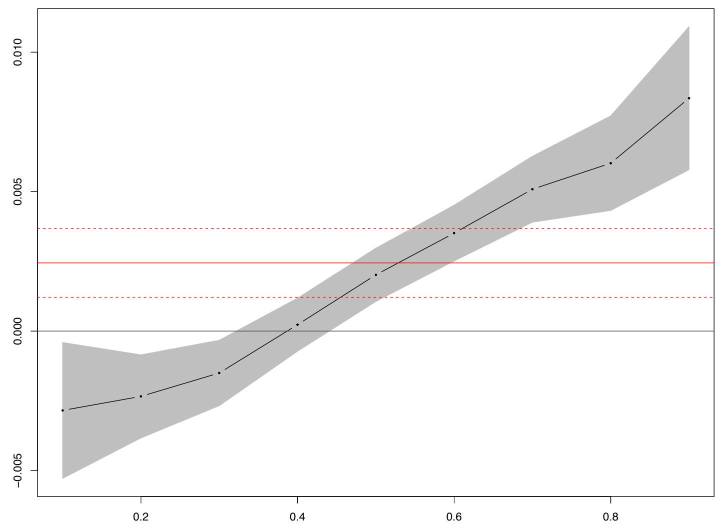
Panel A: Inside Investment Decile against FFC Factor Exposure



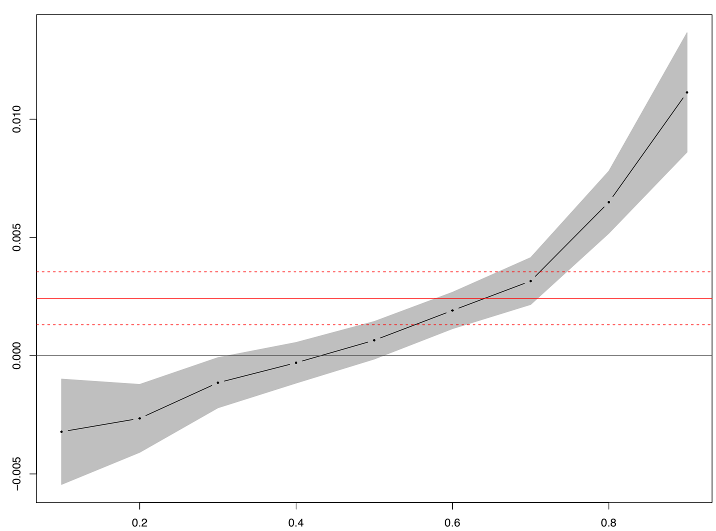
Panel B: Inside Investment Decile against FH Factor Exposure

FIGURE B.4 **Factor Exposure and Inside Investment**

This figure illustrates the relationship between factor exposure and insider investment. For each decile of inside investment, the figures plot the average factor exposures across the two sets of models explored in the paper. Panel A shows the beta exposures from the Fama-French and Carhart model. Panel B shows the factor exposures for the Fung-Hsieh Seven-factor model. In each decile, each average factor exposure is plotted equal-weighting all funds.



Panel A: Quantile Regression, Seven-Factor



Panel B: Quantile Regression, Four-Factor

FIGURE B.5 **Quantile Regression of Inside Investment on Excess Returns**

This figure plots results from a quantile regression of percentage inside investment against fund-level excess returns, also controlling for fund size. Panel A shows the returns corrected for the Fung-Hsieh Seven-factor model, while Panel B shows returns corrected for the Fama-French and Carhart Four-factor model. Across each of the ten deciles of percentage inside investment, we examine the slope of the relationship between inside investment and excess returns. The shaded grey area illustrates the 95% confidence interval. We find that our results are driven by funds at high levels of inside investment.

TABLE A1 **Inside Investment and Excess Returns—Restricting to Funds with Only GP Investment-Related Parties**

This table repeats the analysis of Table VIII, but restricts its analysis to funds with *only* GP investments as their related parties. The first three columns regress against the Fung-Hsieh Seven-Factors, and the next three columns regress against the Fama-French and Carhart Four-Factor model as outlined in equations 4 and 5 in the text, respectively. As in Table VIII: specifications (1) and (4) include size and three lagged returns as controls. Specifications (2) and (3) add firm fixed effects, month fixed effects, and fund level controls (age of fund inception and strategy type). Specifications (3) and (6) include: size, three lags of excess return, and a fund fixed-effect. Standard errors are clustered monthly.

	FH Excess Returns			FF Excess Returns		
	(1)	(2)	(3)	(4)	(5)	(6)
Inside Investment (Percent)	0.0036***	0.0066***	0.0061**	0.0026***	0.0049***	0.0053**
	(0.0011)	(0.0015)	(0.0026)	(0.0010)	(0.0013)	(0.0023)
$\text{Return}_{i,t-1}$	0.0073	0.0100	0.0020	0.1113***	0.0636***	0.0555**
	(0.0428)	(0.0302)	(0.0302)	(0.0223)	(0.0237)	(0.0236)
$\text{Return}_{i,t-2}$	0.0204	0.0075	−0.0005	0.0551**	0.0361	0.0280
	(0.0366)	(0.0269)	(0.0263)	(0.0240)	(0.0232)	(0.0232)
$\text{Return}_{i,t-3}$	0.0232	−0.0301	−0.0371	0.0037	−0.0281	−0.0351*
	(0.0387)	(0.0291)	(0.0292)	(0.0204)	(0.0194)	(0.0196)
Month Fixed Effects	No	Yes	Yes	No	Yes	Yes
Fund Level Controls	No	Yes	No	No	Yes	No
Advisor Fixed Effects	No	Firm	Fund	No	Firm	Fund
Observations	27,304	27,304	27,304	27,304	27,304	27,304
R^2	0.0022	0.2083	0.2166	0.0284	0.1059	0.1170

TABLE A2 **Determinants of Inside Investment**

This table shows a yearly panel regression of inside investment against fund and firm characteristics. Column 1 includes no additional fixed effects, while column 2 adds fund inception year fixed effects, column 3 adds firm fixed effects, and column 4 also adds year of observation fixed effects. Standard errors are clustered at the firm level. The omitted strategy is Equity funds.

	Inside Investment (Percent)			
	(1)	(2)	(3)	(4)
log(Fund Size)	-3.1461^{***}	-3.2257^{***}	-6.4338^{***}	-6.9775^{***}
	(0.4519)	(0.4382)	(0.8473)	(0.8656)
Management Fee	−0.5006	−0.4119	3.7062	4.1315
	(1.6504)	(1.6810)	(3.0880)	(3.0326)
Performance Fee	0.3901^{***}	0.3955^{***}	0.1775	0.1769
	(0.1229)	(0.1230)	(0.2211)	(0.2100)
High Watermark	−0.7488	−0.8052	−1.1501	−0.3707
	(1.5650)	(1.6582)	(2.8761)	(2.8641)
Redemption Days	0.0043	0.0032	0.0079	0.0072
	(0.0082)	(0.0079)	(0.0200)	(0.0193)
Leverage	0.5363	0.3984	-5.0499^{***}	-5.1682^{***}
	(0.9839)	(1.0431)	(1.7544)	(1.7464)
Number of Advisors	0.0405^{***}	0.0371^{***}	−0.0410	−0.0326
	(0.0087)	(0.0097)	(0.0574)	(0.0519)
Strategy:				
– CTA	2.2385	2.4984	5.3826	4.8524
	(2.8050)	(2.9209)	(7.6972)	(7.5276)
–Event Driven	-4.3384^{*}	-4.4216^{*}	13.6770^{**}	13.5364^{**}
	(2.2823)	(2.4024)	(6.9444)	(6.7910)
–Fixed Income	−2.4840	−1.8786	17.8290^{**}	17.8366^{**}
	(2.4639)	(2.4680)	(7.4266)	(7.1818)
–Multi-Strategy	−1.8645	−1.6295	1.6652	2.3089
	(2.6426)	(2.5617)	(6.8248)	(6.9296)
–Other Strategy	-5.6653^{*}	-6.3861^{*}	11.4604^{**}	11.8979^{**}
	(3.3476)	(3.5624)	(5.6058)	(5.7574)
–Relative Value	0.2941	0.1653	8.9426	8.8212
	(3.1162)	(3.1154)	(8.8751)	(8.8400)
Inception Year FE	No	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes
Year FE	No	No	No	Yes
Observations	4,484	4,484	4,484	4,484
R^2	0.0541	0.0890	0.7105	0.7176

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

TABLE A3 **Alternate Specifications for Inside Investment and Return**

This table shows robustness of our main result to the inclusion of funds with zero or 100% inside investment. These funds are excluded from our benchmark results because of difficulty in matching.

	FH Excess Returns			FFC Excess Returns		
	(1)	(2)	(3)	(4)	(5)	(6)
Inside Investment (Percent)	0.0017**	0.0053***	0.0073***	0.0023***	0.0047***	0.0059***
	(0.0007)	(0.0011)	(0.0015)	(0.0007)	(0.0011)	(0.0017)
$\text{Return}_{i,t-1}$	0.0063	0.0098	0.0024	0.1015***	0.0645***	0.0577***
	(0.0379)	(0.0267)	(0.0271)	(0.0203)	(0.0216)	(0.0220)
$\text{Return}_{i,t-2}$	−0.0031	−0.0140	−0.0208	0.0361	0.0190	0.0125
	(0.0331)	(0.0230)	(0.0230)	(0.0227)	(0.0209)	(0.0207)
$\text{Return}_{i,t-3}$	0.0344	−0.0114	−0.0177	0.0147	−0.0114	−0.0174
	(0.0367)	(0.0275)	(0.0276)	(0.0198)	(0.0187)	(0.0188)
Month Fixed Effects	No	Yes	Yes	No	Yes	Yes
Fund Level Controls	No	Yes	No	No	Yes	No
Advisor Fixed Effects	No	Firm	Fund	No	Firm	Fund
Observations	44,060	44,060	44,060	44,060	44,060	44,060
R^2	0.0019	0.1848	0.1922	0.0214	0.0835	0.0927

TABLE A4 **Inside Investment and Excess Returns—Fama MacBeth Regression**

This table illustrates Fama-MacBeth cross-sectional specification comparable to Table VIII. This specification differs in that year and firm fixed effects are not included, and standard errors are computed using the Fama and MacBeth (1973) approach. Inside Investment is measured as the fraction of the fund's assets which are attributable to investments by insiders and related parties.

	FH Excess Returns		FF Excess Returns	
	(1)	(2)	(3)	(4)
Inside Investment (Percent)	0.0022***	0.0021***	0.0015*	0.0019**
	(0.0008)	(0.0008)	(0.0008)	(0.0008)
$\text{Return}_{i,t-1}$	0.0469**	0.0504**	0.0893***	0.0886***
	(0.0225)	(0.0216)	(0.0191)	(0.0192)
$\text{Return}_{i,t-2}$	0.0404*	0.0403*	0.0522***	0.0487**
	(0.0245)	(0.0244)	(0.0194)	(0.0202)
$\text{Return}_{i,t-3}$	0.0130	0.0134	0.0002	0.0050
	(0.0242)	(0.0232)	(0.0170)	(0.0171)
Size Control	Yes	Yes	Yes	Yes
Fund Level Controls	No	Yes	No	Yes
Observations	37,958	37,958	37,958	37,958
R^2	0.2585	0.2836	0.1285	0.1492
Note:		*p<0.1; **p<0.05; ***p<0.01		

TABLE A5 **Inside Investment, Adjusted for Mechanically Reinvested Earnings**

This table examines the role of discretion over personal capital contributions. The *adjusted inside investment* measure subtracts the "mechanical" component of personal capital contributions derived from rolling over prior fee income from the observed inside investment. This residual results in the discretionary capital contributions of the managers. Panel A regresses the adjusted measure of invest investment against all funds, while Panel B restricts this analysis to funds less than eight years old.

Panel A: All Funds

	All	Controls	All	Controls
	(1)	(2)	(3)	(4)
Adjusted Inside Investment (Percent)	0.0039***	0.0085***	0.0028***	0.0069***
	(0.0013)	(0.0017)	(0.0009)	(0.0014)
Log(Fund Size)	No	Yes	No	Yes
Fixed Effects	No	Yes	No	Yes
Observations	41,097	41,097	41,097	41,097
R^2	0.0008	0.0377	0.0011	0.0410
Note:				*p<0.1; **p<0.05; ***p<0.01

Panel B: Young Funds

	All	Controls	All	Controls
	(1)	(2)	(3)	(4)
Adjusted Inside Investment (Percent)	0.0034**	0.0085***	0.0026**	0.0078***
	(0.0015)	(0.0015)	(0.0012)	(0.0017)
Log(Fund Size)	No	Yes	No	Yes
Fixed Effects	No	Yes	No	Yes
Observations	25,938	25,938	25,938	25,938
R^2	0.0005	0.0415	0.0007	0.0424
Note:				*p<0.1; **p<0.05; ***p<0.01

TABLE A6 **Cuts by Fund Size**

This table illustrates our main specification (column 2 of Panel A in Table VIII) across the fund size distribution. We cut by the quantiles of fund size, which correspond to the buckets: [$20m-$57m), [$57m, $126m), [$126m, $378m), [$379m+). Standard errors are clustered at the date level. Fund controls include: year of fund inception and strategy. Fund size controls are omitted, as this is the key variable we are comparing across. Excess returns are computed using the Fung-Hsieh model.

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
	(1)	(2)	(3)	(4)
Inside Investment (Percent)	0.0013	0.0020	0.0039***	0.0059***
	(0.0015)	(0.0014)	(0.0014)	(0.0018)
$\text{Return}_{i,t-1}$	−0.0135	0.0028	0.0083	−0.0252
	(0.0450)	(0.0367)	(0.0346)	(0.0378)
$\text{Return}_{i,t-2}$	−0.0177	−0.0103	−0.0068	0.0037
	(0.0363)	(0.0363)	(0.0372)	(0.0315)
$\text{Return}_{i,t-3}$	0.0313	0.0428	0.0199	0.0226
	(0.0421)	(0.0374)	(0.0436)	(0.0403)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Fund Controls	Yes	Yes	Yes	Yes
Log(Fund Size)	No	No	No	No
Observations	9,269	9,551	9,464	9,674
R^2	0.0193	0.0154	0.0152	0.0215
Note:				*p<0.1; **p<0.05; ***p<0.01

TABLE A7 **Firm-Level Equity Ownership and Returns**

This table shows a panel regression with alternate measures of firm ownership. # of Equity Holders captures the total number of beneficial owners listed in Form ADV for the firm's equity. HHI of Firm Equity captures a Herfindahl-Hirschman index measure of concentration of equity ownership. Standard errors are clustered at the fund level and are shown in parenthesis. Excess return is computed using the Fung-Hsieh model.

	Monthly Excess Return (FH)			
	(1)	(2)	(3)	(4)
Inside Investment (Percent)	0.0029^{***}	0.0024^{***}	0.0029^{***}	0.0028^{***}
	(0.0009)	(0.0008)	(0.0009)	(0.0008)
# of Equity Holders	-0.0174^{**}		-0.0197^{***}	-0.0191^{***}
	(0.0071)		(0.0070)	(0.0068)
HHI of Firm Equity		0.0444	−0.0645	−0.0578
		(0.0826)	(0.0794)	(0.0796)
log(Gross Assets)	0.0312	0.0163	0.0317	0.0350
	(0.0243)	(0.0249)	(0.0241)	(0.0218)
Year	Yes	Yes	Yes	Yes
Log(Size)	Yes	Yes	Yes	Yes
Fund Controls	No	No	No	Yes
Observations	41,097	41,097	41,097	41,097
R^2	0.0105	0.0101	0.0105	0.0116
Note:			$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$	